SCIENCE

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THE RELATIONS OF SCIENCE AND THE SCIENTIFIC CITIZEN TO THE GENERAL GOVERNMENT.*

IN the founding of states, and in the early stages of that development of local and general government that rests on new principles or on novel combinations of well recognized theories, the stress of individual and collective effort for simple existence is the dominant factor in the community. Under such circumstances the systematic investigation of natural phenomena can have no place in the occupations of men, nor receive recognition in those fundamental laws that set forth the rights and the duties of the citizen and the powers of the state.

Republics are born of the impelling desire for the greatest good for the maximum number of citizens, and that democratic impulse reaches its highest activity only when community of interest and comparative equality of estate and station characterize the members of the body politic. With the material development of states the varied energies and capacities of individuals soon introduce aspirations for higher knowledge and also those combinations for wielding financial power which are inseparable from all highly organized communities; and such forces, in their turn, demand not only the practical application

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of scientific methods in every direction, but they are satisfied with nothing less than the latest and best results of scientific investigation.

While this is generally true of the evolution of all states and nations, it is especially characteristic of the progress of our own Republic.

During the existence of the English-speaking colonies in what is now known as the United States of America, the independence of the various colonial governments, the slow and uncertain means of communication, and the general lack of wealth throughout the land, not only furnished no stimulus to scientific activity, but presented effectual barriers against all continuous devotion to scientific investigation. Up to the time of the War of the Revolution the schools and colleges of the colonies would have been held guiltless of wasting any time on the natural sciences. At that time, also, there was no attempt in any of the seats of learning to teach anything but a smattering of mathematics and the physical sciences.

In 1787 science was not recognized by the individual or by ethical, social, educational or political organizations as a prominent factor in intellectual or material progress. In the old and wealthy states of Europe the pursuit of mathematical studies had opened the way for the develepment of the physical sciences; but on this continent the study of algebra, the basis of mathematical analysis, had not acquired a respectable standing in even the best colleges, while in most of the educational institutions of the land the subject was entirely neglected, if not unknown. For that reason alone, the physical sciences could have no place or influence in the thoughts of the people who formed our Federal Constitution.

Without recognition in the organization of the general government, science was left to fight its way along its own lines; struggling at first to reach practical results rather than fundamental laws; sometimes failing and often uncertain in its aims, but still untrammeled by the fetters of bureaucratic domination.

The State, Treasury, War, Postoffice and Law Departments of the general government were organized in 1789; the Navy Department in 1793, the Interior in 1849 and the Department of Agriculture in 1889. The real or fancied needs of a government devised to promptly respond to the widely divergent interests and activities of an energetic people soon made it necessary to have under its own control some of the means for producing results by the best known scientific methods.

In a halting and half-hearted way a number of attempts were made to lay the foundations of scientific attachments to some of the executive departments. These centers of scientific activity were set in motion by widely different influences, though all were united apparently in seeking immediate and practical accessions to the material welfare of the country.

When considerable progress had been made in the installation of these new ventures it was found that the men of scientific training, the only proper personnel for such work, were not to be found in this country, and the development of the scientific worker, under more or less incompetent direction, was the first obstacle to be overcome. With that remarkable adaptability and energy which has characterized the American mind in its struggle with the forces of nature during the last century, the men for prosecuting the work of these new establishments were found and were mostly trained in this country.

That the best plans and the most efficient methods were not always adopted was to be expected, but it may be truthfully said that in the short space of fifty years the generosity of our general government so fully met the demands of the people for

scientific work and investigation that the cost of buildings and apparatus, together with the apparent propects for immediate and valuable results, compels a not unfavorable comparison with the progress of two centuries in the older and more wealthy countries of Europe.

That these achievements were not all real or highly satisfactory was not altogether the fault of the scientific men who zealously labored in the good cause. Under a monarchical or paternal form of government the nominal head possesses the power and assumes the responsibility. The heads of departments and the directors of public works are given certain powers and are held to a rigid accountability. An *ideal* republic might enjoy similar advantages, but a republic *in esse* is not always so fortunate.

Theoretically, all citizens of a republic owe their government equal and faithful service; but actual equality of individuals under any form of government, save in regard to the right to protection of person and property under the law, is a myth, a weak survival of the time when popular sentiment misquoted reason in the arena of practical politics. Out of this erroneous theory, however, has grown in our Republic a somewhat hazy and ill-defined feeling that any citizen is competent as an executive, an administrator, a legislator, a jurist or a director of scientific investigation.

This nebulous but popular belief in the varied aptitude of our citizens has in many instances resulted in serious damage to some of those centers of scientific work which come under the control of the Government.

For many years the political theory that 'to the victors belong the spoils' cast its baneful influence over the scientific as well as the business branches of the executive departments, and social and bureaucratic, leagued with political, influences left few positions for the unfortunate men of science who were forced to rely on the power of their own accomplishments.

Another and by no means a minor factor in the relations of science and the Government is a popular notion of the status of the scientific investigator in society in this country. From one standpoint he is regarded as a human prodigy, gifted beyond his fellows, able to fathom all the subtle mysteries of nature; one by whom all moral and social as well as physical problems are readily solved with more than ordinary human certainty. On the other hand, when the practical politician, or some other fortunate man born to direct affairs, assumes the direction of a branch of the government service he looks upon the scientific man as a more or less harmless eccentric, a feeble specimen of manhood, but, unfortunately, sometimes necessary to the existence of his bureau. Pity for his assumed helplessness is mingled with crude flattery in such proportions as are deemed expedient to secure the necessary professional work, while at the same time the unhappy man of science is assured that he is peculiarly fortunate in having the guidance and protection of a man of affairs who knows the ways of the world.

It is hardly necessary to say that, as a matter of fact, both these extreme views of the scientific man are usually wrong. In general he differs from his fellows only in the possession of some peculiar aptitude or talent for study or investigation in some department of science. He may be a good chemist, and shirk every duty of a good citizen; a learned mathematician, with manners and tastes that bear no trace of gentle breeding or moral training; a gifted biologist, but with a selfish greed that puts him out of touch with the best citizens, the wisest government or the true unselfish seeker after truth in any sphere of human endeavor; in short, the manifestation of ability in scientific pursuits, as in other

walks in life, does not necessarily imply the possession of good morals or the other qualities that make the good citizen. The true scientific man *ought* to be the highest type of moral and patriotic development, since, above all other men, he should fully recognize the unfailing logical relation of cause and effect.

The sooner he is freed from the injustice of absurd flattery on the one hand and ignorance and vicious criticism on the other, and is permitted or obliged to stand on his own merit as a citizen and as a scientific worker and investigator, the better it will be for science and for our country.

Again, the real scientific man has no more need of a business manager than has a lawyer, a doctor or any other professional man. From observation and from experience gathered in the service of the Government for a third of century, I am convinced that the genuine scientific men in the Executive Departments and throughout the country have as much executive and administrative ability as any other class of citizens in the land.

The nature of their interests and pursuits tends to make them less demonstrative than most other men, and in their own ranks those who make the most display and noise in the public press and otherwise are generally least effective as investigators or as directors of real work.

Organized as most of our Government scientific bureaus are, subject to a change in the controlling force, at least every four years, it would be strange, indeed, if the individual members, from their almost constant contact with the practical politician, did not unconsciously acquire some of the habits of thought and action of those who have learned to so manipulate the primaries that the final outcome of an apparently free election shall result in purely personal rather than public advantage.

That some scientific men have not entirely avoided this contagion may be inferred if one studies the methods sometimes employed to obtain the influence that recommends candidates for important positions and that frequently controls such appointments.

The usual remark in such cases that, "after all, scientific men are only human," is not sufficient excuse for any man whose first duty is to be a good citizen.

In Washington one frequently hears the complaint that the scientific man does not receive that respectful consideration from the Government which he really deserves. One also hears in this connection an uncomplimentary comparison between the honors bestowed upon scientific men under our republican Government and those conferred upon their fellows by the imperial rulers of foreign nations. That there is some truth in these views may not be wholly denied, but it should be remembered that, to a great extent, in this country, as in all others, the scientific men have this matter under their own control.

Many times in every year the executive and administrative officers of our Government find it necessary to ask for the opinions and counsel of scientific men. Frequently these same men feel moved to offer their views and advice to the Government, and on all such occasions they have ample opportunity to exhibit whatever unselfish, self-respecting and patriotic characteristics they may possess. If, however, the representatives of the Government find that a body of scientific men have urged the appointment, to a position of trust and responsibility, of one whom they must have known, if they knew the man, was morally and mentally unfit for the place; or if they put in train a scheme for their personal aggrandizement or professional profit, then they have plainly cheapened their own influence and damaged the reputation of all scientific men in the country in the opinion of the

Government officials; and they have no right to complain of lack of appreciation by men whom they have once deceived. Those who would win the respect of others must first respect themselves.

The widely scattered condition of the scientific bureaus of the Government in Washington is sufficient in itself to prevent a normal development of those interests in which the whole country is concerned, and for which important legislation and large appropriations have been urgently invoked

If the opponents of scientific work under the control of the general government had sought for a system that should produce generally the least valuable results for the money and energy expended, it would be difficult to see how they could have devised a plan better suited to their purposes than the one which has existed in Washington for many years.

Until the organization of the Department of Agriculture no change had been made, since the foundation of the Republic, in the custom of founding scientific bureaus or divisions in the various departments, like mission churches on the extreme frontier, with scant visible means of support, and no active, intelligent or discriminating official interest as an effective, sustaining power in the inevitable struggle with adverse legislation and ill-considered, semi-official criticism.

In the fiscal year of 1895–6 Congress appropriated in round numbers $4,500,000 for such scientific work as requires special and technical training in those who carry out the details, and a high degree of scientific knowledge and skill in those who actually plan and superintend the work and finally prepare and present the results to the public.

This amount is very unequally divided between the Treasury, War, Navy, Interior, Agriculture and Labor Departments, and amounts, in the aggregate, to about *one per cent.* of all the money appropriated for these several departments. Considering the total appropriations for each department it is found that scientific work is accorded in the Treasury Department about *one-half of one per cent.*; in the War Department *six-hundredths* of one per cent.; in the Navy Department *seventy-six* hundredths of one per cent.; in the Interior Department *one* per cent., and in the Agricultural Department *fifty-three* per cent.

It should be noted that the Department of Agriculture was organized for a special purpose—to treat the vast interests of agriculture in a technical and scientific manner; and it is the only executive department of the Government whose principal interests and energies are fostered and guided by the methods and the results of modern science.

The highly important duties of a national character which require the daily attention of the heads of the large executive departments naturally occupy all the time at their disposal and absorb their active interest.

Under such conditions it is not likely that the quiet and undemonstrative scientific bureaus can receive the intelligent care and sympathy necessary to their proper development. It can not be said truthfully that this lack of support is due to any fault of the various Secretaries.

It is due primarily to the inherent weakness of a system which, if it ever worked well, in the present crowded and complicated work of the larger departments, now leaves the various scientific bureaus to shift for themselves and permits them to be driven out of the field of consideration in competition with the imperative and legitimate work of such departments.

It is not likely that this unfortunate condition of the scattered scientific bureaus will improve under the present conditions.

This peculiar situation has been a source of considerable anxiety in the minds of many scientific men for the last fifteen

years, and it has not escaped the notice of several thoughtful members of both branches of the national legislature. On January 5, 1888, the Hon. R. W. Townsend, of Illinois, introduced in the House of Representatives a bill 'To establish a Department of Industries and Public Works,' under which should be collected all those bureaus and divisions of scientific work under the control of the general Government, except such as were essential to the distinctive duties of the several existing executive departments.

The author of this bill intended to improve and strengthen all these centers of investigation by bringing them under one executive head, whose sole business would be to protect their rights, provide for their support and represent them with authority before Congress and in the executive councils.

Unfortunately for the scientific interests involved, Mr. Townsend died before his proposition could be considered in the committee to which it was referred; and no comprehensive plan of that nature has since been considered by Congress. The general scheme formulated by Mr. Townsend was approved by scientific men throughout the country, as well as by those in the Government service in Washington, and it has not been abandoned.

It should be said, however, that it has not received the *universal* assent of scientific men either here or in other parts of the country. The scientific man is sometimes swayed by the same motives that influence other people.

If his field of view is limited by the narrow bounds of his own specialty; if he feels certain of getting all he wants for his own particular investigation, or that the present chief of his department is generous to him personally; if he feels that it is more agreeable to rule his small office absolutely while nominally under the control of an easy-going but untrained chief, rather than to help forward the whole cause of scientific investigation; or, if he feels that lack of intelligent supervision enables him to manipulate the affairs of his office for his own immediate, personal reputation, aggrandizement or pecuniary profit; he is likely to prefer the present system rather than one that aims to so arrange and adjust all the scientific bureaus of the Government in such a way that their mutual relations shall be harmonious, and their several interests continually advanced under economical and thorough methods, but without friction or duplication of work.

It is not the object of this communication to point out the selfishness or incompetence of individuals or the shortcomings of bureaus or departments, but to call anew the attention of the members of this society to their relations to the general Government either as citizens or as scientific investigators.

It should never be forgotten that our Government as represented by the Executive, Legislative and Judical powers is simply the agent of the people, not *some* of the people, but *all* of the people, and that they are entitled to the best service to be found within the borders of our broad domain.

To that end it follows that personal claims, clamor of cliques, and the greed and selfishness of those who seek to hold or gain official position, should have little or no weight in the proper organization and control of the scientific work of the Government, where professional merit and adaptibility alone should guide the selection of the personnel, and where practical and theoretical results and investigations, in their proper mutual relations, and controlled by wise economy, should be the single aim of the Government.

It may be exceedingly difficult to fix the time when this desirable consummation shall be affected; but to all scientific work-

ers, both in and out of the public service, who really believe that there has been notable progress along the lines of scientific investigation in this country since 1789, it presents a common goal towards which all may strive; a higher ideal of the relations of science and the government, and a more patriotic conception of the true relations between the intelligent citizen and the government in a genuine republic.

J. R. EASTMAN.

WASHINGTON, D. C.

THE NEW YORK STATE SCIENCE TEACHERS' ASSOCIATION.

III.

THURSDAY, December 31st, two sessions were held in the new Medical College of Syracuse University. The morning meeting was devoted to Biology. Professor C. W. Dodge, of the University of Rochester, read a paper on 'Biological Work in the High School.'* He was followed by Dr. Thomas B. Stowell, of the Potsdam Normal School, with a paper entitled:

The Educative Value of the Study of Biology.

MR. PRESIDENT: Memory of the many days that we have labored together in the Biological Laboratory gives me greater boldness to continue this discussion, for I shall rely upon you, sir, to supply whatever may be lacking in my argument to make sure defense of the cause which I gladly espouse.

I shall outline my idea of the educative value of the biological studies from two standpoints: their value by virtue of the psychology of the study; and second, because of the demands of practical life. And I shall venture to concrete my conclusion by suggesting methods and measures to make this scheme effective and operative.

*At the request of the Association, Professor Dodge repeated this paper, which he prepared last spring for the University Convocation of the State of New York. It is printed in Regents' Bulletin, No. 36, September, 1896, pp. 46–62.

Two problems confront us at the threshold of practical life: the ever present 'bread and butter' problem, type of all utilitarian questions; and processes or procedures to effect desired ends, *i. e.*, the multiple forms of ethical questions whose solution depends primarily upon taste, for I take it that men differ little in conclusions from demonstrable or even from probable premises, which are intellections; the radical difference in men is in taste, or in the emotions which prompt to specific action.

The final cause of study is both cultural and utilitarian; forces or agencies which afford increased facility in developing and in directing the energies or the activities of soul are termed cultural; the results of these forces, that which discovers what is utilized or may be used in every-day life, that which conduces to personal comfort and pleasure, and that which fosters the discovery of such forces and ends are practical, utilitarian.

I shall not contend for the ultilitarian value of the nature studies, for their contribution to temporal comfort, to happiness, to longevity and to prosperity is generally conceded.

The discussion is restricted to the cultural value of such studies. To fit men for life in a broad sense demands such soul-furnishing as will insure correctness in judgment; acquisition of such habits as will guarantee prompt action; and assurance of conduct conformable with the high standards espoused. If I err not, a critical examination of the school curriculum will disclose the fact that its final cause is intellectual acumen rather than moral power; in other words, intellectual activity rather than emotional is the purpose of the schools. I do not decry the schools of to-day; I do not advocate lowered standards, but I urge most persistently the need of culture of the emotional life which is the spring, the source of conduct. Modern psychology has happily

abandoned the hypothesis of faculties, and studies the self, the soul as a unit. This discussion assumes the constancy of the aggregate of soul energy and its non-correlation with radiant energy; in other words, *the number of units of soul energy, potential and kinetic, is constant.* The radical difference then between the educated and the illiterate is in the ratio of potential to kinetic power.

This defines the province of the school, which is to furnish proper stimuli to render active and available the possible, inherent and inherited energy.

There is little debate regarding the order of succession, and the dependence of the forms of mental activity. Admitting that nearly every form seems to be involved or implied in every other form it is customary and convenient to speak of these forms as separate. Following this order, the first end sought in an educative procedure is to effect a sensorial modification, *i. e.*, to produce a definite change in the cortical cells, which change automatically induces a corresponding change in the self or the soul and gives it form or experience, or the precondition of knowledge.

These partial and vague experiences, percepts, must be related, interpreted; they must receive *meaning* which is put into them by virtue of their relations to previous and correlated experiences, else they necessarily remain unintelligible. The condition of experience thus interpreted by the self to the self is what contemporary pedagogics terms appercept, the basis of all clear, definite, positive knowledge.

I have thus briefly outlined the first stages in intellectual activity to get more clearly before this body the reason for my position in my first contention which is:

Contention 1. *That the study of biology is preeminently adapted to awaken those psychoses —forms of soul-activity—which prepare for the demands of practical life.*

I am not prepared to admit that content of mind is secondary in soul development. I am aware that we recall individual and exceptional cases where we have been accustomed to concede great learning with little ability for application; but I am led to raise two questions at the very beginning of the inquiry: 1st. In these cases has the existence of apperceptive scholarship been definitely established? 2d. If this be conceded, has it been shown that under proper stimuli there is the claimed lamentable weakness? I am not contending for restricted specialization, but I do hold that the ignoring of the value of mind content has been and still is a lamentable weakness in the school curriculum. Let me again recur to the primary law of knowledge development, viz: that percepts must be related and interrelated before definite meaning or knowledge can be predicated. The failure to insist upon clear, verifiable forms is a prolific source of superficiality and of baneful habit. Something more than effort is needed. I cannot concur with the traditional dogma that the educative value of a process inheres in the effort. Nerve tracts are not trained to definite and specific response by ill-directed conditions. Meaning cannot be put into new forms from vague percepts. The character of the form acquired is too important to be ignored or even to be relegated to a secondary position.

It seems to me, sir, that a radical defect in educational theory has grown out of a misconception of the nature of so-called mental power. It is a matter of grave moment what is studied, what is known; and it is of far greater importance to heed well the habits formed and the tastes induced. The failure of men who address themselves to the various avocations in life; the numberless wrecks occasioned by futile attempts to occupy positions for which neither heredity nor education has prepared ought to be sufficient demonstration of the fallacy of the 'ef-

fort' hypothesis, and ought to provoke serious controversy regarding the nature of mental power. How long must we observe that success in a given kind of work is no guarantee of success in another, and that expertness in one direction is an almost infallible proof of mediocrity in another, before we shall concede the *specific* nature of mental power. It is this concession which gives preeminence to modern pedagogics. It is impracticable and unphilosophical to talk about symmetrical development. My contention so far has been to show the superior value of nature study as a source of material for sensuous stimuli which are the basis of all knowledge of the outside world and of its myriad relations; and, furthermore, the source of those stimuli which will induce precise and economic action of nerve centers and nerve tracts, a prerequisite to the formation of habit and taste. I concede the spiritual nature of these psychic forms, but I contend for their physical basis.

Accepting the proposition as established, the question arises by what agencies can habits be induced which will insure promptness and accuracy of execution. The demand of the age is for ability to totalize energy, to focalize power and quickly. This is my second contention: *That in culturing value nature studies are not surpassed by other branches of study.*

Conceding that nature study does not furnish all the data demanded for the solution of all of life's problems, I still hold that the habits induced by their study and, what is of far greater importance, the tastes developed are of superior value in training to manliness. Dr. Kuss says that "the association of conception with ideas and their union with feelings and aspiration is under the control of education." And Dr. Radestock vigorously states that "scientific education is only worth anything and is of vital importance when its actions, powers and means have become firm and steady habits;" and Rousseau, more than a century since in his Emile, "Education is certainly nothing but a formation of habits;" and Locke, a century earlier, "We must expect nothing from precautionary maxims and good precepts, though they be deeply impressed on the mind, beyond the point at which practice has changed them to firm habits." These citations are made in corroboration of what has been advocated. I do not contend that the humanities are wanting as means to the desired end, but by reason of their less sensuous nature they are not as well adapted to form the beginnings of habit which they admirably strengthen and supplement.

My third contention is that *the study of nature is preeminently ethical, since the exactness demanded by all scientific research fosters and necessitates love of truth.*

It seems hardly necessary to mention in this presence the value of nature study as promotive of the habit of truthfulness. That the ethical value of scientific training has been questioned may be referred to the early practice of advocating this study because of the attractiveness of objective and concrete study, until many regarded nature study as a sort of amusement or entertainment. I assume that the larger portion of this audience is connnected with some one or more of the scientific associations of the country. I need but call attention to the character of the papers, and to their criticism to demonstrate the fact that with the student of science *truth is supreme.* With him hypotheses are abandoned as cheerfully and as promptly as they are formed. Experience teaches that this ability to set aside cherished ideas is not easily acquired, but the very inexorableness of nature schools men to place priceless value upon truth. A scientific liar is a misnomer, a self-contradiction.

The importance of the habit of truthfulness is worthy of greater emphasis than the

limits of the paper will permit. I cannot refrain from calling attention to the clearness with which the students of biology learn that the omission of a single step in the treatment of tissue, or even the slightest variation from a specified course of procedure, will invariably modify or invalidate the results attained. This lesson has great educative value in impressing upon the mind the consequences of variation from truth in all procedures, demonstrations or speculations.

Having given so large a portion of my time to the discussion of pedagogical principles, I hasten to the suggestion of modes and measures to make this scheme effective and operative.

Whenever the teacher is prepared by previous training to present the subject of comparative zoology, my experience of 21 years as teacher of biology has convinced me that the best results can be secured with students of high-school grade by beginning with the simplest unicellular organisms and proceeding to the more complex. The pupil who has a clear, definite knowledge of an amœba is prepared to comprehend the structure of complex forms, and with this knowledge he cannot fail to grasp the secret of animal morphology. When some of the more complex forms are studied minutely the problem presents two phases: shall one form be studied minutely, and shall the available time be given to the study of a few types, or shall the study of a single type be less exhaustive and a larger number of types be examined?

I am satisfied that I have secured the best results by the study of many types, for comparative study rendered the knowledge of each type apperceptive, and the enlarged circle of experience gave the enlarged interest based upon enlarged knowledge which cannot exist with a restricted content to the concept. Thus in the study of the cœlenterata we examined not only a simple hydra, but studied one or more complex marine forms, some from actual alcoholic specimens, others by means of charts and diagrams. Polyp, anemone (Metridium), jelly-fish (Aurelia), holothurian (pentacta), sea-urchin (Toxopneustes), sand-dollar (Echinarachnius), brittle-star (Ophiopolis), not only aid in the formation of a correct concept of the Coelenterate type, but the knowledge gained from the study of each makes the study of the others more significant. I do not hesitate to affirm that the examination of half a dozen type specimens carefully dissected by the teacher will give a clearer and better knowledge of the type in one class period than a week's study of a single specimen by an untrained pupil who is vaguely working in the dark, with scalpel and specimen, acquiring habits of wastefulness and slovenly generalizations. Where time and appliances will permit, more individual work is desirable; the best and the most economical mode known to the writer is that inaugurated and followed by Dr. B. G. Wilder, of Cornell University, in what he has happily named Practicums.* But quantity is essential to quality, a principle true in every line of research. Something more than effort is demanded.

After careful training to observation of the significance of homologues it is of great value to let each pupil trace a type structure, *e. g.*, the distribution of a spinal nerve in two or more types, as in the cat, dog, rabbit, and learn the significance of persistence of type-forms. No exercise of mind can be made more conducive to that judicial habit which is essential in every department of life and yet is so rare.

From a utilitarian standpoint all this knowledge of animal structure and function becomes the basis of the study of

*Outline directions for these Practicums can be obtained by addressing B. G. Wilder, Ithaca, N. Y. Price, $1.00.

human anatomy and physiology. The vexed and vexing problem of how to teach the effects of narcotics in our schools can not be solved until our teachers are more thoroughly grounded in the matter to be taught and their profound convictions have awakened corresponding emotion which will result in consistency in instruction and in life.

Time forbids detailed mention even of an outline course of study of botany, the most easily taught and the most available of the biological subjects. It should have a place in every grade from the kindergarten to the University.

I am met with the objection that proper equipment of schools for study of biology and anatomy is expensive. To which I gladly make reply: The equipment of a school for the study of English or of the Classics is expensive, but who ever argued against the study of Latin or Greek because of expense of lexicon or grammar or text, and furthermore the objection is based upon a misapprehension of the facts. It is not necessary to have a museum in every school. Type-forms alone are required. Fresh-water clams, snails, slugs with the convenient salt-water clams are accessible for a few cents, and these furnish the data for the study of the lamellibranchs, their differentiæ and their homologies. Fresh-water and marine lobsters are within reach of every school, and no one will complain because of scarcity of material for the study of insects.

The study of the life history of a common beetle will fix in the mind of the student the relation of environment to life more vividly, hence more availably than tomes of unintelligible literature, made unintelligible because of lack of experience as the foundation of interpretation.

It may matter little whether a stray bone belongs to ruminant or rodent, but it matters not a little whether the boy who finds the bone has awakened in him a desire to know its relation and whether he knows how to proceed to solve the problem. The habit of comparative study, the ability to give just values to data, to weigh evidence, so indispensable to success, but alas, so rare, cannot be over estimated.

Time limitations exclude the discussion of the value of the habit of confidence in ultimate discovery of truth. The attitude of soul with which the student of nature addresses himself to a given task is no less sublime than that with which the Priest of Israel entered the Holy of Holies to have direct audience with the *I Am*. This faith in law, this love for truth, this sympathy with creature and Creator are the birth-right of every child; the school can give it; angels can do no more.

Mr. Charles N. Cobb, of the Regents' office, said that, however desirable it might be to have science taught in our schools by college graduates, the fact is that most of our science teachers are not college graduates. A large part of the science pupils of the State are in the small village schools. Many of the science teachers in these schools are normal graduates. The teacher of science in the normal school may be called on to teach physics, chemistry, zoology, physiology, geology, mineralogy and astronomy. The *established* normal course in this State gives 20 weeks to each of the first two previously mentioned sciences, and ten weeks to each of the others. This is modified slightly by the various normal schools.

The discussion of Mr. Cobb's remarks developed the fact that normal school graduates, prepared in this manner, frequently find their way into the high schools of the State as teachers of science, often, however, against the best judgment and advice of their normal school teachers.

Dr. C. W. Hargitt, of Syracuse Univer-

sity, referring to the lack of adequately trained teachers for the best sort of science work in the schools, said that a bungling or half-hearted teacher will never be able to produce satisfactorily prepared students, whatever time or equipment he may have at his disposal. The teacher who aims chiefly to prepare pupils for *examinations* will be equally unsuccessful. Examinations will take care of themselves if we have teachers whose primary aim is to teach science, to infuse into the mind of the pupil the scientific spirit.

It is gratifying to know that some of our normal school principals enter protest against the disposition to offer science positions to even normal graduates, if their special training for science teaching is inadequate. May it not come within the province of this Association to enter similar protest if necessary, aye more, to exercise a mild though vigilant censorship over the science work of the schools, and seek by every reasonable measure to secure constantly better results.

We must be cautious about placing biology among the exact sciences, or holding out unwarranted expectations as to the infallibility of experimental results. This may be all right in physics or inorganic chemistry; it is unsafe in biological teaching. The very fact that this is, preeminently the living science, having to do with the *occult* processes of *life*, the most distinctive character of which is change, renders many results in biological experimentation exceedingly capricious. Indeed this is one of the very charms of the science. Nor is its educational value any the less on this account.

Superintendent Henry P. Emerson, of Buffalo, spoke on some of the practical difficulties attending science work in the lower grades of city schools. Nature study lacks vitality unless it is begun early. A canvass of the school children in a number of Buffalo schools a few years ago revealed the fact that many of the pupils had never seen a lake, a hill, or the Niagara River. Hereafter every pupil in the fourth grade is to have at least *one* excursion a year, visiting some of the public works, the park and the river front. In the high school, excursion work has been a prominent feature in the study of botany and geology for the past twenty-five years, every Saturday during warm weather being improved systematically for the exploration of the vicinity. It is only by such studies, pursued in this manner, that the artificial and mechanical element of school work can be broken up.

Mr. Arthur G. Clement, of the Regents' office, said that in visiting over 175 schools of this State last year he saw some good science work even in our smaller villages where the teacher is usually one from the normal school.

The Regents have their ideals in regard to the teaching of science, but do not expect to see them realized until schools are more fully equipped. Accordingly the examinations in science are prepared in view of the conditions existing in the schools. It is the intention, however, that the nature of the questions shall indicate to some extent the kind and method of teaching which they hope to see gradually established in the schools, and it is expected that teachers will recognize these hints and act accordingly.

In zoology it is recommended to study a single type in each branch in accordance with laboratory methods. The order of progress should be from the lower to the higher, with constant attention to the increasing complexity of structure and its correlation with increasing differentiation of function from branch to branch. If properly done, this work will necessitate observation, discrimination and comparison, and it will impress the pupil with the idea

that the method of life is from the simple to the complex, which is the greatest lesson to be learned from this study, since it is also the method of growth of all social phenomena.

Professor A. D. Morrill, of Hamilton College, thought that if the colleges and universities knew more of the objects toward which the Regents are striving, and the difficulties with which they are contending, it would enable the colleges and universities to be of the greatest help in the advancement of science in the secondary schools.

The chief requisite for the instructor is to be able to arouse mental activity, to care more for the soul of the pupils than for the amount of knowledge that he can impart to them. Thorough scientific training can often awaken pupils who have been wholly uninfluenced by language teaching. It is not so important what the science is as how it is taught. When pupils are taught to use books and not to worship them they are in a position to begin to learn. But the laboratory is of no value except as a means to an end—the awakening of the pupil.

Professor R. E. Dodge, of New York, was glad to notice the emphatic disapproval of systematic botany and zoology. In the study of biology interest can be at once elicited by showing that all living things are attempting the same tasks of life in different and yet similar ways. Function as producing form, comparative morphology and forms as the result of function, should be studied in the early years of education. Thus a basis for interest and better love for nature can be aroused through the sympathy that comes from understanding.

Professor Warren Mann, of Potsdam Normal, was sure that if the same quantity and quality of work were given to science that are now given to languages the results would be equal to or even better than those in language courses. He would not cry down the languages, but he would cry up the sciences until they have an equal footing in all respects with the languages. The next ten years will witness great strides in science study. This Association should be one of the means to that end.

Professor B. G. Wilder, of Cornell, admitted that after thirty years of teaching he still found it dificult to determine the proper sequence of biological subjects and the manner in which they should be presented. He warmly commended the address of Professor Wm. North Rice, 'Science Teaching in the Schools.'* He heartily agreed with Professor Rice as to the introduction of elementary physiology into the lowest grade of schools, but urged that, instead of beginning in the fifth grade, the nervous system should have a place in the first. The very difficulty of the subject demanded that its rudiments be acquired early. Paradoxical as it sounds, the brain, as a gross object, is easier to study than the heart. He would have the sheep's brain put into the hands of the youngest scholars to draw and observe. At later stages comparison should be made with the brains of cats and dogs, and, still later, the general plan of the vertebrate brain should be elucidated upon that of the green turtle. In every high school should be at least one well-preserved human brain and a series illustrating the development of the organ. From scholars thus early and gradually familiarized with fundamental facts and ideas much might be expected in universities and medical schools.

Mrs. S. H. Gage, of Ithaca, spoke of the desirability of keeping the minds of the children pure by telling them the truth about their own origin and development.

Professor John F. Woodhull, of New York, in view of some of the criticisms of

* Delivered at the meeting of the American Society of Naturalists, December, 1887; printed in the *American Naturalist*, September and October, 1888. Published by D. C. Heath & Co.

science work in the State, contended that poor work in science is better than none at all. If we are ever to have good science teaching we must first *begin*.

There have been many sins committed under the head of 'teaching observation.' We are learning that one may be a very good observer in lines in which he is interested, but very unobservant in other lines. We must not expect more of the children than of ourselves. Observation is only good when you have some use for it, when you are looking for something to relate to something else. This is scientific observation.

Dr. Frank Baker, of the University of Georgetown and Superintendent of the National Zoological Park in Washington, remarked that the teaching of science in the schools of Washington, D. C., begins in the low grades, children being taught to observe common objects of biological interest, note their parts and describe them. They are often taken out upon excursions into the country to observe the geological formations, the plants and the animals. The Zoological Park, free to the public, is much used for this purpose. He also remarked upon the ethical bearings of science teaching.

Dr. Herbert Williams, of the University of Buffalo, was one of the few representatives of the medical schools of the State who were present. He thought that teachers in medical schools might have attended these meetings with much profit. Too little thought is given to *methods* of teaching, even in medical schools of the highest standing. He was delighted with the prominence given to laboratory work. Medical schools are constantly giving more time and increasing facilities to laboratory work. But, after all, this can include only a part of the field to be covered. The pupil can verify some of the facts given him to study, but the major part must still be learned outright and taken for granted. Yet laboratory work covering part of the ground studied gives a more concrete idea of the whole and makes the student feel more certain of the realness of what he learns second hand.

He was astonished that no one else seemed to have met with the difficulty that he had felt most keenly. Though he had the necessary laboratory equipment and an earnest, intelligent class of students, he found it very difficult to teach the large numbers that came to him—twenty-five to fifty at a time. Even with the help of two or three assistants he found it impossible to assure himself that every one of his pupils saw things correctly with the microscope and appreciated what he was looking at. Suppose a class is studying the amœba. The practical difficulties of showing the amœba to each of fifty students are great. If they are beginners you may use up an afternoon in finding amœbas for each of fifty students and in distinguishing them from air bubbles, bits of dirt, and all the innumerable living things seen in stagnant water, to say nothing of having your students interpret the object correctly after they have found it.

More time is needed for science work, and smaller classes, and he believed medical schools were trying to teach their students too much, but at present the situation must be met as practically as possible. The conditions in the high schools must often be very much the same in these respects as in the medical colleges, and it is surprising that high school teachers have not been more impressed with these difficulties.

Dr. Charles J. Walch, of Syracuse, spoke of the successful work in nature study in the Syracuse kindergartens, where the children study in their own gardens the development and growth of different plants. He warmly endorsed Mrs. Gage's sentiments.

Professor George F. Atkinson, of Cornell, thought that the outline for the study of zoology as presented in the Regents' Bulletin offered encouragement for the presentation of a much better course of study in this subject than was the case with botany.

With a few exceptions the study of botany in the high school is merely the study of the various members of the higher plants with the sole view of using this knowledge in 'running down' the plant to its name. This method of study has brought the science of botany into disrepute in many quarters. If we should study zoology in a similar way we might confine ourselves to the birds and study the various kinds of feathers, the modifications of the beak, toes, etc., with the sole purpose of using the knowledge of these things to trace, with the aid of a key, the bird to its name. No one would call such work zoology. No more is the similar method employed by many in dealing with plants botany, and yet in many places the word botany suggests that kind of study alone. It has sometimes seemed to the speaker that if it were possible to drop the word botany we might at the same time do away with certain prejudices against the study of plants; and if we should instead use the word *phytology* the study of plants would thus be placed among 'ologies,' and would at once, from the very name, be recognized as a science!

Regarding the study of types it was suggested that no plant is a type of a branch or class of plants, and that the study of several plants in a class would give a better knowledge of the characteristics of the class than the study of a single one. The study of a single plant or animal to represent a large group may be carried too far in the case of beginning students. By going deeply into the minute structure of a single plant or animal a mass of facts is obtained, which may be very interesting and wonderful, but which do not in themselves teach any great principle. It would be better for the young student to study the plant or animal less thoroughly and to study others of the same class in comparison.

Emphasis was laid on the importance of so conducting elementary science study as to bring frequent deductions of some fundamental law or principle from the few facts observed. Training in such methods of study, the comprehension of fundamental principles, and the tying together of the facts observed into a living whole, gives far greater power than the mere observation of many wonderful details of a few organisms.

Principal S. G. Harris, of Baldwinsville, seconded the ideas of the preceding speaker on the inductive method in biology. In the grades this method may be used to advantage in order to foster a love of nature and prepare the pupil for the work of the high school. By skillful questions and suggestions the teacher leads her pupils to see the facts of one form and another in nature about them. Frequent repetition of this operation fixes the habit; so that when the pupils reach the high school they have not only a habit of observation and a love for the study, but also the pegs on which they may hang subsequent knowledge—apperceptive centers about which new facts may be grouped. Then, and not till then, are they prepared intensively to study any living form, singly or comparatively.

No wonder some pupils do not take to the study of science in high school or college, if they must begin by mastering classification, technical terms and a sea of facts, without either a desire for the facts, a habit of seeing for themselves or a single fact by which to fasten their knowledge. Too often teachers seem to think than one must have the knowledge of a specialist to rightly teach pupils in these studies, so great is the field. Here is the danger, not that the teacher may know too much, but that she may *tell too much*. The idea is to

direct thought as induced by the object studied, not to pour into the young mind thoughts of others. There is no surer way of disgusting a child with nature than to give him laws and technical terms that are beyond his years.

Dr. Amelia Earle Trant, of the Buffalo high school, spoke from the standpoint of a high school teacher of physiology working under conditions not altogether favorable, such as large classes, and pupils with no previous knowledge of chemistry or physics. While thorough scientific work here is perhaps impossible, there are, however, certain definite results obtainable which are not only valuable and practicable, but also consoling and, on a broad outlook, satisfactory. She must be satisfied to ignore the meagre amount of technical physiology possible to be taught under such conditions, if a few things in English and ethics can be mastered.

For instance, she would be satisfied if the definition of physiology is so clearly understood that the word may be used interchangeably with its synonyms, use, function, action or office; if the distinction between the terms physiology, anatomy and hygiene is clear beyond question; if the vital, practical import of personal hygiene and of public sanitation is too firmly impressed to be forgotten; if the difference between vivisection and dissection is clear enough for missionary work in the household—information as to the value, the necessity and the place of each being so much needed in these days of sensational head lines; if the etiquette of class demonstration, is acquired, so that all material is regarded with appreciative interest rather than with amusement, flippancy or pseudo-disgust; if reverence for the wonder and the mystery of created things is so increased that the pupil's attitude of kindness could but be approved by the Humane Society; if a little lesson in broad-mindedness is learned and the Ainsworth Law found not to be the whole of alcohol; if interest has been aroused—even if the majority of boys, and girls as well, decide with the iridescent imagination of youth that they will be physicians; if the knowledge of physiological problems yet to solve will be likely to make simple reading of scientific discoveries interesting in the days to come; if at the end of the term most of the pupils are able to hold their own in a test from the outside, questions reasonable and broad, such as the Regents' examinations have been of late; and finally she is satisfied if, when leaving the subject, the pupils take with them its most important lesson of life—that the physiological axiom, "The well being of the whole depends upon the integrity of the unit," is also a great ethical truth, inexorable not only in the human organism, but also in the school, the family, the State and the Nation.

The other speakers were Professor H. J. Schmitz, of Geneseo Normal, and Dr. Frank McMurry, of Buffalo School of Pedagogy.

The convention closed with a business meeting Thursday afternoon. A number of changes were made in the constitution. It was decided to have a committee of nine members appointed by the President to report to the Association at its next annual meeting on the following subjects: (1) The recognition of science as a requirement for entrance to colleges. (2) Science courses for secondary schools. (3) Nature study in elementary schools.

The following officers were elected for the year 1897. The presidency was offered to Professor Gage for another year, but at his earnest request, another was nominated in his stead.

President, Dr. E. L. Nichols, Cornell University; Vice-President, Dr. Charles W. Hargitt, Syracuse University; Secretary and Treasurer, Dr. Franklin W. Barrows, Buffalo High School.

Executive Council. Four years—Dr. Charles W. Dodge, University of Rochester; Principal Henry Pease, Medina High School; Professor W. C. Peckham, Adelphi College, Brooklyn. Three years—Dr. J. McKeen Cattell, Columbia University, New York; Professor LeRoy C. Cooley, Vassar College, Poughkeepsie; Professor E. R. Whitney, Binghamton High School. Two years—Professor Irving P. Bishop, Buffalo Normal School; Mr. Charles N. Cobb, Regents' Office, Albany; Professor C. S. Prosser, Union University, Schenectady. One year—Professor Albert L. Arey, Rochester Free Academy; Professor R. E. Dodge, Teachers' College, New York; Professor T. B. Stowell, Potsdam Normal School.

FRANKLIN W. BARROWS,
Secretary.

MIGRATION OF BATS ON CAPE COD, MASSACHUSETTS.

BAT migration has received little attention. Various writers have made vague reference to the fact that certain bats are found in winter at localities where they are not known to breed, but no detailed account of the migratory movements of any species has yet been published. The only special paper on the subject that I have seen is by Dr. C. Hart Merriam,* who clearly establishes the fact that two North American bats migrate. The data on which this conclusion rests are as follows: The hoary bat, one of the migratory species, is not known to breed south of the Canadian fauna. In the Adirondack region it appears about the middle of May and disappears early in October. During the autumn and winter it has been taken in South Carolina (Georgetown, January 19th), Georgia (Savannah, February 6th), and on the Bermudas† ('autumn'). As the writer remarks, these facts may be fairly regarded as conclusive evidence of migration. The evidence of the migratory habits of the silver-haired bat rests chiefly on the animal's periodical appearance in spring and fall at the lighthouse on Mount Desert Rock, thirty miles off the coast of Maine. This species has also been observed on the Bermudas.

In August and September, 1890 and 1891, I had the opportunity to watch the appearance and disappearance of three species of bats at a locality where none could be found during the breeding season. Highland Light, the place where my observations were made, is situated near the edge of one of the highest points in the series of steep bluffs of glacial deposit which form the outer side of Cape Cod, Massachusetts. The light, which is less than ten miles from the northern extremity of the cape, is separated from the mainland toward the east and northeast by from twenty-five to fifty miles of water. The bluff on which it stands rises abruptly from the beach to a height of one hundred and fifty feet. I found the bats for the most part flying along the face of this bluff, where they fed on the myriads of insects blown there by the prevailing southwest winds. They chiefly frequented the middle and upper heights and seldom flew over the beach at the foot of the bluff or over the level ground about the lighthouse. I do not know where the animals spent the day, as careful search in old buildings, under the overhanging edge of the bluff, and in deserted bank swallow holes, failed to reveal their hiding places. It is possible that they found shelter in the dense, stunted, oak scrub with which the bluff is in many places crowned, but of this I have no evidence. I hope that the observations given below may again call the attention of field naturalists to a subject which presents many difficult and interesting problems.

ATALAPHA NOVEBORACENSIS* (RED BAT).

August 21, 1890. The first bats of the season were seen this evening. There were

*Trans. Royal Soc. Canada V (1887), Section V, p. 85, 1888.

†I may add that I have a bat of this species, killed at Brownsville, Texas, on October 22d.

*With bat nomenclature in its present unsettled state it is well to use the names adopted by Dr.

only two, and I could not positively identify them, but they were probably red bats.

August 25, 1890. An adult male taken.

August 28, 1890. Two seen.

August 29, 1890. The evening was too chilly for many bats to be on the wing. A few *A. noveboracensis* seen and two taken.

August 30, 1890. Six or eight *A. noveboracensis* seen and three taken. The evening was warm and bats flew much more freely than on the 29th.

August 31, 1890. A chilly evening again, and only two bats seen, both *A. noveboracensis.*

September 2, 1890. A few red bats seen and two taken.

September 5, 1890. I was not at Highland Light this evening, but Mr. W. M. Small reported a heavy flight of bats. He shot five, all *A. noveboracensis.*

September 8, 1890. Heavy fog, so that no bats could be seen, if any were moving along the face of the bluff. Three or four red bats flew about the light house tower during the first half of the night, feeding on insects attracted by the light. They flew mostly below the level of the deck which encircles the tower about six feet below the lantern and never approached the light itself.

September 12, 1890. A single red bat shot this evening.

After this date I watched for bats on several consecutive evenings. As I saw no more I concluded that the migration had ended.

August 25, 1891. Fourteen *Atalapha noveboracensis*, the first bats of the season, seen this evening. They were flying both north and south.

August 26, 1891. Evening very foggy. A red bat which flew about the lighthouse was the only one seen.

Harrison Allen in his latest Monograph of the Bats of North America (1893), although many of these will require revision.

August 27, 1891. Half a dozen red bats seen and one taken.

August 28, 1891. Four red bats seen. All flew toward the south.

August 30, 1891. A red bat caught in a house near the edge of the bluff.

September 2, 1891. Eight or ten seen and three taken. The movement this evening was mostly, though not wholly, from north to south.

September 3, 1891. Six seen and three taken.

September 5, 1891. Evening cold and misty. No bats moving.

September 7 and 8, 1891. A few bats seen each evening, but none taken. All appeared to be this species.

September 10, 1891. One red bat shot.

September 11, 1891. One seen.

September 12, 1891. One killed. About a dozen bats seen, but how many were of this species, and how many *Lasionycteris noctivagans* I could not determine.

September 13, 1891. About a dozen bats seen. Two of these were certainly red bats.

After this date I watched for bats on consecutive evenings for more than a week. As I saw none I finally gave up the search.

ATALAPHA CINEREA (HOARY BAT).

August 26, 1890. One *Atalapha cinerea*, the only bat seen, shot this evening.

August 28, 1890. Two hoary bats taken, and at least two, and probably four, others seen.

August 30, 1890. Two taken and two others seen.

September 2, 1890. Only two seen. Both taken.

No more hoary bats seen during 1890.

August 25, 1891. A single *Atalapha cinerea* seen flying south along the face of the bluff this evening.

September 2, 1891. One seen flying north.

September 12, 1891. An adult male shot—the last of the season.

At Highland Light I found the hoary bat less active and irregular in its movements than the red bat. Its large and comparatively steady flight made it easier to shoot than either of the two smaller species with which it was associated. It began to fly immediately after sunset. In the Adirondacks Dr. C. Hart Merriam found the hoary bat a late flyer, and an exceeding difficult animal to kill on account of its swift, irregular motions.* It is possible that while on Cape Cod the animal modifies its habits on account of the unusual surroundings in which it finds itself. The fatigue of a long migration might also have an appreciable effect on a bat's activity.

LASIONYCTERIS NOCTIVAGANS (SILVER-HAIRED BAT).

September 1, 1890. One silver-haired bat taken.

September 2, 1890. Four taken and perhaps a dozen others seen.

The silver-haired bat was not seen again during 1890.

September 10, 1891. Three shot and probably half a dozen others seen. They were mostly flying north.

September 11, 1891. Two shot and four or five more seen.

September 12, 1891. About a dozen bats seen. Some were without doubt this species, but just what proportion I could not tell.

While September 12th is the latest date at which I have seen *Lasionycteris noctivagans* at Highland Light, I have a specimen killed there by Mr. W. M. Small on October 28, 1889.

GERRIT S. MILLER, JR.

ZOOLOGICAL NOTES.

MUSEUMS AND SCIENCE.

THE recently published report of the 1896 meeting of the Museums Association of Great Britain shows how much interest is taken and thought bestowed in rendering museums instructive and attractive to the public. The most interesting of the eleven papers read, however, is one from the sharp-pointed pen of Mr. F. A. Bather, dealing with the scientific rather than the popular side of museums, and entitled 'How May Museums Best Retard the Advance of Science?' Chief among these is "that jealousy with which a museum curator should guard the precious specimens entrusted to his care, forbidding the profane hands of the mere anatomist ever to disturb them in their holy rest." This is a well-aimed shaft, for specimens have no value save for the information to be extracted from them, and yet, in too many cases, they are regarded as fetishes and, like *Spirula* and *Notorycles*, carefully bottled up with the probability that they will eventually go to pieces without yielding up any information. Another point on which Mr. Bather dwells at some length is the "idea of keeping certain collections separate according as they happen to have belonged to some person with a lengthy name * * * or to have been presented by some individual who laid it down in his will that his specimens were to be known for all eternity as the 'Peter Smith Collection.'" This is a matter that was touched on by Dr. Goode in his principles of Museum Administration, and, as he says, "the acceptance of any collection, no matter how important, encumbered by conditions, is a serious matter, since no one can forsee how much these conditions may interfere with the future development of the museum." Fortunately, the bequests received by the larger museums of the United States are practically unhampered. Other methods of impeding the progress of science are noticed, such as striking dullness through the hearts of thousands by funeral rows of stuffed birds with their melancholy Latin names, and, as Mr. Bather says, much may be done if a museum will keep its material carefully to itself. On the question of

*Trans. Linn. Soc. New York, II, p. 78–83. 1884.

loaning specimens Mr. Bather dwells lightly, owing to his connection with the British Museum, whose policy in this respect is well known. Here, again, we in this country are fortunate, as most specimens, even types, may be borrowed by workers in museums and some knotty problems thereby unravelled, but the main propositions in the paper demand a careful consideration. Finally, Mr. Bather seems to use the term type a little vaguely, as one does not feel quite sure whether he means type or typical material. There can be but one type, or one series of specimens collectively forming a type, and no museum can afford to permanently part with these. Typical specimens are quite another matter, and the more distributed the better.

A DOG OF THE ANCIENT PUEBLOS.

Among the many objects obtained by Dr. Fewkes last summer from the ruined pueblo of Chaves Pass, Arizona, is the cranium of a domesticated dog, found in a grave with a human skeleton. Although the mere fact of a dog being discovered under such circumstances is in itself interesting, it is not at first sight remarkable, since it is well known that in America, as elsewhere, the dog was domesticated at an early date, and Clavijero mentions an ancient dog which he calls "a quadruped of the country of Cibola, similar in form to a mastiff, which the Indians employ to carry burdens." Aside from the fact that this is the first dog's cranium discovered by Dr. Fewkes, there are some points of special interest in the present case. Most of the Indian dogs are more or less wolfish in their aspect, and have long skulls with comparatively low foreheads, thus showing a small degree of specialization in the way of breed, and this is true of such of the mummied dogs of Egypt as I have seen. The cranium of the Chaves dog, on the contrary, is of the broad-faced type, with high forehead, and, curiously enough, is precisely similar in size and proportions to the cranium of an Eskimo dog from Cumberland Sound, the resemblance extending to the peculiar concavity and squareness of the nasal region. While this is an interesting coincidence, it is not brought forward as implying community of origin, but as instancing long domestication in order that so well-marked a breed could be established. A curious confirmation of the early origin of this breed was received from San Marcos, Texas, where, in excavating for ponds, at the station of the U. S. Fish Commission, a human skeleton and bones of other animals were found in a layer containing many flint implements, overlaid by two feet of black soil. The bones were those of existing species, including teeth of several bison, and there was also a fragment of a dog's skull similar in size and proportions to that obtained at Chaves Pass. Owing to the circumstances under which the bones were exhumed it is not known whether or not the dog and man were found together. While none of the bones were mineralized, the condition under which they were found, and the character of the human cranium, showed them to be of very considerable age.

Dr. Fewkes states that the skulls of carnivores are used in Hopi religious ceremonies and that the skull, paws, etc., are regarded as powerful fetishes of warriors and cherished by them with much care. It is customary to bury a priests' fetishes with him, and there is little doubt that the dog's cranium from Chaves Pass was a fetish of the man in whose grave it was found. As Dr. Fewkes believes that the people of the Chaves Pass ruin formerly lived far south, in contact with Nahuatl peoples, it can readily be seen how a dog's skull came to be part of the ceremonial outfit of the priest in whose grave it was found.

F. A. Lucas.

U. S. National Museum.

CURRENT NOTES ON ANTHROPOLOGY.

EUROPEAN ETHNOGRAPHICAL MUSEUMS.

A VERY useful report on the ethnological museums of central Europe has been published by the Dutch Ministry of the Interior, from the studies of Dr. J. D. E. Schmeltz (Ethnographische Musea in Midden-Europa, E. J. Brill, Leiden, 4to. pp. 109).

It contains the observations made during his personal visits to all the great collections of Berlin, Vienna, Munich, Paris, London, etc., in the summer of 1895. Many of the more interesting objects are described and figured, and both the contents of the Museums, their arrangements for display and their architectural plans are discussed. Dr. Schmeltz is thoroughly conversant with the literature of modern ethnography, and his numerous references to monographs and special articles are a fruitful lesson in themselves. There is an excellent index, in which I note that 'America' includes objects in twenty of the collections visited.

ETHNOGRAPHICAL SURVEY OF GREAT BRITAIN.

THE fourth report of the committee of the British Association which has this survey in charge has been published. It is of exceptionable interest, its leading feature being an article by Mr. G. Lawrence Gomme, on the method of determining the value of folk-lore as ethnological data. In this he explains the principles of the classification and analysis of the facts gleaned by folk-lore researches, and illustrates the scientific method of handling them by a a discussion of the fire rites and ceremonies retained among the rural population of the United Kingdom. The conclusions he reaches are valuable, both in themselves and as a fine exemplification of the correct plan of utilizing such material to enlighten us as to early considerations of social life, concerning which history tells little or nothing.

The general report is drawn up by the Chairman, Mr. E. W. Brabrook, and is accompanied by notes from the Secretary, Mr. E. Sidney Hartland.

D. G. BRINTON.
UNIVERSITY OF PENNSYLVANIA.

NOTES ON INORGANIC CHEMISTRY.

M. BERTHELOT has recently published in the Comptes Rendus analyses of weapons, tools, etc., from Tello, in Chaldea. Their date is put from 4000 to 3000 B. C. A large lance and a hatchet were found to be approximately pure copper, and another hatchet was of copper with traces of arsenic and phosphorus, by which it seems to have been hardened. No trace of tin was present in any case. Thus in Chaldea an 'age of copper' seems to have preceded the 'age of bronze.' An egg-shaped object from the same locality, weighing 121 grains, was of iron; an ingot of white metal was 95 per cent. silver; a leaf of yellow gold was found to contain considerable quantities of silver.

THE following order appears in the English scientific journals: "In consequence of the growing importance of carbid of calcium, and the fact that the mere contact of moisture with this material causes a dangerous evolution of the highly inflammable gas known as acetylene, the Home Secretary has caused inquiries to be made into the subject, with the result that an Order in Council has to-day been made under the 14th section of the 'Petroleum Act, 1871,' bringing carbid of calcium within the operation of that Act. Accordingly, from the date on which such order comes into force, viz., 1st April, 1897, it will be unlawful to keep carbid of calcium, except in virtue of a license to be obtained from the local authority under the Petroleum Act."

THE Council of the Chemical Society (London) have awarded the Longstaff medal to Professor William Ramsay, F. R. S.,

for the discovery of helium and his share in the investigation of argon.

The last Proceedings of the Chemical Society contain a further study in spectrographic analysis by W. N. Hartley and H. Ramage. The alums are found to contain *all* the alkalies as well as copper, silver, gallium, thallium, nickel and manganese. Of these the thallium comes from the pyrites, but the other elements from the aluminous minerals, bauxite and shale. The Stassfurt minerals were found to contain no rubidium, cesium, gallium or thallium, and only barest traces of elements other than the principal ones composing the minerals. Steel (from Middlesborough) contained the alkali metals, calcium, copper, silver, gallium, manganese and lead. It is pointed out that this method of spectrographic analysis might lead to results of practical importance in the study of railroad steels, as copper, (?) silver, gallium and lead have not been considered in dealing with commercial irons, and their influence upon the physical properties is unknown.

The *Gazzetta Chimica Italiana* contains an article by U. Antony and T. Benelli on the action of water of various degrees of purity on lead pipes. The greatest solvent action was in the case of distilled water, especially when saturated with air. Aeration with carbon dioxid retarded the action one-half. Water containing calcium sulfate or sodium sulfate possesses about one-half the solvent power of pure water, and the action here also was much retarded by aeration with carbon dioxid. Bicarbonate of lime had only about one-fourth the solvent power of pure water, but when aerated by carbon dioxid its action was nearly doubled. Common salt had little action except in the presence of carbon dioxid, and seemed to often slightly diminish the solvent powers of other salts. These results are rather at variance with the generally accepted ideas and seem to show that waters with permanent hardness would be seriously contaminated by passage through lead pipes and ordinary hard waters only somewhat less so. The maximum amount of lead dissolved was 130 parts per million, for five days contact of 150 ccm. ordinary distilled water with 285 sq. cm. lead; the minimum 6.8 parts per million for water containing sodium chlorid and aerated with air.

In the same number of the *Gazzetta* Professors Antony and A. Lucchesi describe the reaction of an excess of mercurous chlorid on auric chlorid with the production of the characteristic color of purple of Cassius. Similar results are obtained with cuprous chlorid and the chlorid of gold. When barium sulfate and mercurous chlorid are suspended in water and auric chlorid added, the barium sulfate takes up the gold and becomes the color of the purple of Cassius. From these experiments the authors conclude that the true purple of Cassius is not a definite compound, but merely stannic acid mechanically colored with metallic gold. J. L. H.

SCIENTIFIC NOTES AND NEWS.

THE THREATENED LEGISLATION AGAINST SCIENCE AND EDUCATION.

The Ways and Means Committee of the House, either convinced by argument or coerced by the force of public opinion, has retracted the duty on scientific apparatus and books imported for institutions in cases in which the apparatus and books are not manufactured in the United States. It is satisfactory to find that the committee is willing to reconsider its ill-advised action, even though it has but partially corrected its blunders. The provision imposing a duty on instruments and books also manufactured in the United States is ambiguous and will cause endless confusion. If the Encyclopædia Britannica is pirated in America will that prevent its importation for a library? If a microscope is manufactured in America will that prevent the importation of all instruments

called microscopes? Mr. Dingley has stated for publication that his objection to exceptions in the tariff is the trouble they cause custom house officials, but he appears now to propose exceptions that can only be defined by the Courts.

We asked the leading makers of scientific instruments in the United States whether they regarded a tax on instruments imported for educational institutions as likely to be beneficial or harmful to them. The answers were about equally divided. One maker writes: "We know that putting these on the free list ruined our business in that line." Consequently his business must have been ruined in the eighteenth century. Half of those who favor the duty had not heard of its proposal, and it thus seems that it was not planned in consultation with those interested. If Mr. Dingley had consulted makers of instruments he would have found opposition to his plan. Thus Messrs. Warner and Swasey write us: "We believe that all institutions of learning should be able to purchase their instrumental equipment in the cheapest market, and that thereby the good of all will best be secured. We would, therefore, be loathe to have any duty imposed that would interfere with the best results of our schools and colleges, as we fear would be the case should the proposed duty come into effect." Mr. John A. Brashear states that he is making more instruments for foreign than for home universities.

We feel sure that our legislators at Washington wish to do the best they can for the country and for themselves. If it be brought to their attention that books and instruments are the raw materials of science, education and civilization they will not wish to tax these. When they see that the leading Republican papers, such as the New York *Tribune*, the Boston *Transcript* and the New York *Independent*, oppose such legislation, they will not wish to carry its burden through the elections of 1898 and 1900.

GENERAL.

PROFESSOR W. W. HENDRICKSON, head of the department of mathematics at the Naval Academy at Annapolis, has been appointed Superintendent of the American Ephemeris and Nautical Almanac, in succession to Professor Simon Newcomb. The retirement of Professor Newcomb, on reaching the age limit fixed by the naval authorities, has called forth many notices in appreciation of his great contributions to science.

THE American Mathematical Society will hold its summer meeting at Toronto on Monday and Tuesday, August 16th and 17th. It will thus follow the meeting of the American Association for the Advancement of Science at Detroit, and precede the meeting of the British Association at Toronto.

As we have already announced, the Fourth Triennial Congress of American Physicians and Surgeons will be held at Washington on May 4th, 5th and 6th. The sessions of the societies will be held in various places, the American Physiological Society and the American Anatomists having been assigned rooms in the Columbian University. The President of the Congress, Professor William H. Welch, of Johns Hopkins University, will deliver an address on Wednesday evening, May 5th, at 8.15 o'clock, in the Columbia Theatre. The exercises attending the unveiling of the statue of Professor Gross, under the auspices of the Surgical Association, will be held on Wednesday, May 5th, at 5 o'clock. The Executive Committee has decided that the Congress shall give a dinner on Tuesday evening, May 4th, at the Arlington, to which guests will be invited. On Wednesday evening, at 9.30 o'clock, the President of the Congress will receive the members, the invited guests and the accredited visitors, with the ladies accompanying them, at the Arlington. On Thursday evening the Cosmos Club will give a complimentary 'smoker' to the Congress.

THE Sinking Fund Commissioners of the City of New York upon March 25th unanimously adopted a resolution setting aside the entire southern portion of Bronx Park, comprising 261 acres, for the establishment of a Zoological Park. The tract is directly in the geographical center of the great 'annexed district.' The conditions are that the Society shall raise $100,000 before entering the tract, and an additional $150,000 within three years

from the date that the work of improvement of the land is begun by the Park Department. The Society will contribute the buildings and collections of animals. The city will expend $125,000 immediately in the preparation of the land, and will during the first year of occupation provide a maintenance fund—not exceeding $60,000—for the care of the animals and further improvement of the park. In a coming issue of SCIENCE a full account of the plans of the Society will be published.

THE Missouri Legislature has made the usual biennial appropriation of $30,000 for the support of the State Geological Survey. In Iowa the law governing the Survey has been incorporated in the new code, thus assuring the permanence of the work. In both States the bills passed without opposition of note.

THE sixty-ninth meeting of German Men of Science and Physicians will be held at Brunswick from the 20th to the 25th of September of the present year. There will be thirty-three sections as compared with thirty at the Frankfort meeting. The new sections are anthropology and ethnology, which at Frankfort was united with geography, geodesy and cartography and scientific photography.

THE scientific work which is such a prominent part of the manufacturing chemical establishments of Germany is again borne witness to by the fact that the firm of Friedrich Bayer & Co., manufacturers of dye stuffs in Elberfeld, has purchased the library of the late Professor Kekulé, consisting of 18,000 volumes, and said to be the most complete collection of chemical works in existence.

FROM the plans submitted in the competition for a statue of von Helmholtz, those by the sculptors Lessing, Hertert and Janenseh have been selected and exhibited in Berlin. The final selection has not yet been announced. The statue will be placed in the court of the University near the statues of the two Humboldts.

A COMPANY has been organized in Berlin for the establishment of a German colonial museum.

IT is reported that Dr. Nansen will lend the Fram, the vessel in which he made his Arctic journey, to a private Arctic expedition that will start during the coming summer. The expedition will be mainly English, and its purpose will be meteorological observations and an examination of the Arctic currents.

MR. CHARLES ELIOT died at Brookline, Mass., on March 25th, at the age of thirty-seven years. Mr. Eliot was the landscape architect of the Boston Metropolitan Park Commission. The admirable park system of Boston and the preservation of public reservations throughout the State are largely due to his influence.

WE regret to note the deaths of Dr. Kolbe, professor of mathematics in the Polytechnic Institute at Vienna, at the age of seventy-one years, and of Dr. Wilhelm Doellen, the astronomer, in Dorpat, aged seventy-seven years.

A PUBLIC meeting to promote the National Jenner Memorial was to have been held in the theatre of the University of London on March 31st. It was expected that the chair would be taken by the Duke of Westminster and that addresses would be made by Lord Herschel, Lord Playfair, Lord Lister and Professor Foster.

DR. RUDOLF KOBERT, professor of medicine in the University at Dorpat, has resigned to take charge of the hospital for consumptives in Gorbersdorf, in Silesia. It is said that the Russian authorities do not wish to retain German professors in Dorpat.

THE mortality figures for the four weeks ending March 12th, at Bombay, are as follows, in chronological order: Deaths from all causes, 1,772, 1,525, 1,370, 1,274; deaths from plague, 843, 730, 635, 521. The plague shows a tendency to spread and deaths are reported from many places, including for the week 206 in Karachi.

ACCORDING to the *Bulletin of the American Mathematical Society*, Professor O. Schlömilch, the founder of the *Zeitschrift für Mathematik und Physik*, has withdrawn from the editorship of this journal, which he has conducted for 41 years. Dr. R. Mehmke, professor of mathematics in the Polytechnic School at Stuttgart, takes his place, while Professor M. Cantor, of the University of Heidelberg, will continue to have charge of the 'literarisch historische Abteilung.'

THE students of Stanford University have be-

gun the publication of an *Engineering Journal*, which will be issued semi-annually. The first number opens with an article by F. A. C. Perrine, entitled 'A Practical Index of Engineering Literature,' which is followed by several other articles showing the high character of the work in engineering accomplished in Stanford University.

A MONTHLY journal entitled *Deutscher Tierfreund* has been established in Leipzig under the editorship of Dr. R. Klee.

THE first edition of the New York State botanist's report on 'Poisonous and Edible Fungi' has proved insufficient to supply the demand, so that it will be impossible to fill further orders for the work unless a new edition is printed.

DR. HENRY E. ARMSTRONG has prepared an extended article now being published in successive numbers of *Nature* entitled 'The Need of Organizing Scientific Opinion.' The article is a severe arraignment of the lack of scientific principles and research in British manufactures and of English educational methods as compared with those of Germany. Dr. Armstrong writes of the United States as follows: "America is bound, in fact, to develop, and not only on account of the restless energy of her people; her Government departments have attached to them many active men engaged in initiating or conducting scientific inquiries; and when the various departments are organized *inter se* the country will have in its service a highly-trained body of scientific experts guiding all branches of public work and cooperating to minimize the faults of democracy. And universities are arising all over the country, in which German models are being followed, not English. It is safe to predict that, ere many years are past, the United States will suddenly burst into prominence, and probably into predominance, as a nation promoting scientific inquiries of all kinds, so surely is a foundation being laid. Mistakes will frequently be made, perhaps, but they will soon be recognized and remedied in a country instinct with advance."

THE *Engineering News* states that a textile school has been established in Lowell, Mass. The city appropriated $25,000 for its support, and the manufacturing establishments contributed $50,000 in machinery and other facilities. The equipment is said to compare favorably with that of similar schools in England and on the Continent, where they have been maintained for a number of years and are constantly growing in number. It is stated that the competition of Southern mills in the production of ordinary grades of cotton goods has led the Lowell manufacturers to turn their attention to the finer grades, which have hitherto generally been imported from Europe, where the textile schools have been of great aid in training skilled workmen and designers.

SIR DOUGLAS GALTON has issued an appeal for subscriptions to the Childhood Society, which has recently issued a report on the scientific study of the mental and physical conditions of childhood, giving details of 100,000 children, examined individually. It is estimated that the sum of £1,000 would be needed to examine 50,000 children in twenty-five towns.

UNIVERSITY AND EDUCATIONAL NEWS.

HAVERFORD COLLEGE has now received the title deeds to the real estate of the late Jacob P. Jones, of Philadelphia, who in 1885 made the College his residuary legatee. The estate is valued at $900,000. Haverford College, which is located near Philadelphia and is conducted under Quaker auspices, is now one of the best endowed of our colleges. The trustees have wisely decided to maintain a strong college and not to attempt the development of a university.

THE long contested Marett will case has been decided by the Supreme Court of Connecticut, giving, among other public bequests, $18,000 to Yale University.

IT is reported in the daily papers that the late Mr. Deury, said to be a multi-millionaire and the largest landowner in the United States, has left his estate to his widow for life and at her death ninety-one hundredths of it for the establishment of a college in Illinois.

BILLS have been reported favorably in the New York Legislature authorizing New York City to spend $12,500,000 in school buildings.

DR. JULIAN APRICIO has been appointed Director of the Meteorological and Astronomical

Observatory of San Salvador. Dr. Szymonowicz, of the University of Cracow, has been made associate professor of histology and embryology in the University of Lemberg.

DISCUSSION AND CORRESPONDENCE.

RELATIONS OF TARSIUS TO THE LEMURS AND APES.

UNDER this title Mr. Charles Earle, in your issue of February 12, 1897, gives a valuable contribution to our knowledge of the mutual relationship of recent and fossil Lemurs and discusses at the same time a proposal made by myself to remove Tarsius from among the Lemurs and to place it with the Primates *s. str.*

Such proposal finds but scanty favor in the eyes of this able paleontologist, who formulates the *a priori* objection that "we shall be little benefited by this change in the classification of the Primates, as it will be exceedingly difficult to discover any characters of the skeleton by which we can separate the Apes from the Lemurs."

Now, I hold that the primary object of classification is not to facilitate or to benefit, but to establish, as closely as possible, the true position which species and genera, both living and fossil, occupy in the actual line of descent, which is slowly but surely revealing itself to the persistent and combined efforts of paleontology, anatomy and embryology.

At the same time, if Mr. Earle finds fault with the embryologist who wishes to transfer Tarsius from the Lemurs to the Apes, he is fully entitled to stand by his osteological and dentary characters and to fight for the current classification, that is apparently more convenient to paleontologists. He is, however, bound to state the arguments of his opponent fully and fairly, and this he does not do when he suggests to his readers that my reason for removing Tarsius from the Lemurs lies in its different 'type of placenta,' nor is he quite up to date in his valuation of recent placental investigations when he complacently quotes Mivart's and Balfour's warnings against the systematic value of differences in placental arrangements, when not accompanied by other characteristic differences.

It is, indeed, rather hard upon me, who have endeavored, in the past eight years, to clear up some of the confusing views that were being entertained concerning placentation in general, to be now pilloried by Mr. Earle as if *I* had been making that coarse and indiscriminate use of placentary characters in classification against which I have been all the time loudly protesting. Thus, for instance, I have shown that the placenta of the hedgehog, the shrew and the mole is in each case a structure *Sui generis*, all these different Insectivores having placentas of the discoid shape, but which reveal themselves, on close and careful examination, both in their structure and in their genesis, as far more different *inter se* than is the diffuse placentation of the horse from that of the Lemurs or from the cotyledonary placentation of the Ruminants. I have hitherto refrained from proposing changes in the classification of the Insectivores, because I am well aware that to make these fruitful the paleontological and anatomical evidence tending in the same direction will first have to be collected and sifted. Nor would I dream of bringing Tarsius in closer connection with the Apes on account of the discoid placenta, for the very same reasons that it is not the external shape, but the histological and the genetic details, which are of importance in any such comparison. Still Mr. Earle would make the readers of SCIENCE believe (see p. 258) that this is my line of argument!

Referring to my paper in the *Gegenbaur Festschrift* (1896)—the abstract of which appeared in an October number of SCIENCE and can hardly have remained unknown to Mr. Earle—it will there be seen that I founded the closer relationship between Tarsius and the Apes on something quite different, viz., on the development of the embryo in a vesicle to which it does not become attached by means of an outgrowing allantois, but to which it is fixed from the beginning by a stalk of tissue ('Haftstiel' or 'Bauchstiel' of the Germans), which was up till lately only known as a characteristic feature of the human embryo, but which Selenka also discovered in monkeys (Cercocebus a. o.), and which in Tarsius has now for the first time revealed its entire developmental history, in-

cluding a very aberrant mode of formation of the mesoblast and the coelome. We are fully entitled to say that by the details of its very earliest development and of its blastocyst Tarsius is more closely related to man and the monkeys than it is to any other known mammal. And that the gulf separating Tarsius from the Lemurs on this head is far wider than that separating it from many Insectivores. This may be inconvenient for paleontologists, but none the less it remains a stubborn fact. And a fact of all the more primary importance because we must recognize that the influence of external agencies on the gradual modification of teeth and of limbs is certainly more direct than that which is brought to bear upon these very early and very hidden and intricate processes that occur inside the uterus in a most delicate vesicle that is hardly visible to the naked eye.

These few words of protest against an obvious misrepresentation may suffice. A full account both of the early development and of the placentation of Tarsius is in preparation; to this I may be allowed to refer those who might desire a fuller account of the various points above alluded to.

A. A. W. HUBRECHT.

UTRECHT, March 8, 1897.

THE JOURNAL OF SCHOOL GEOGRAPHY.

TO THE EDITOR OF SCIENCE: Professor Russell's discussion (SCIENCE, March 19) of the expediency of starting an independent *Journal of School Geography*, instead of consolidating the existing geographical journals into a single publication under the joint management of the various geographical societies in this country, affords a very pretty basis for divided opinions. To my mind there is no probability at present that the American Geographical Society, the National Geographic Society, the Appalachian Mountain Club, the Geographical Society of Philadelphia, the Geographical Society of the Pacific, and the Sierra Club of California will merge their interests and journals into a single American Journal of Geography. However attractive such an ideal may be, it does not accord with the usual run of human nature. Local and individual effort, manifested not only in the maintenance of local societies, but in the publication of more or less local journals, is likely to be the course of geographical events for many years to come.

Improvement of the existing geographical journals is probably a matter that their respective editors have warmly at heart, and I believe that they are all agreed as to the first step towards such improvement; namely, an increase in the number of geographers among their members. Several different methods may be effective in promoting this increase. The societies offer various attractive opportunities to members, in the way of libraries, lectures, excursions and so on. This promotes membership, and among increasing members it is fair to suppose that there will be an increasing number of geographers. Quite another method looks to the production of a larger crop of geographers, when the children of to-day shall reach manhood and womanhood. This method is of slow action, but, if it acts at all, it is sure. It tries to strengthen the future crop by careful cultivation of geography during school years. This is, along with other objects, one of the chief ends of the promotors of the *Journal of School Geography*. It is an end that cannot be attained by Professor Russell's plan, for the expense of such a journal as he proposes would put it entirely out of reach of schools and teachers. Moreover, in the present condition of geography and of teachers of geography in the schools of this country, there is no reason for disguising the fact that a general journal of geography, however ably edited and however well supplied with 'studies for students,' could not possibly attain the circulation among school teachers that may be attained by a special journal of school geography, directly and wholly prepared for teachers' use.

It is worth noticing that the systematic encouragement and development of geography in the schools has never been a leading feature of any geographical society in this country. The American Geographical Society, with a large membership and a rich library, has had no influence worth mentioning on the teaching of geography in the schools of New York; it has never (unless within the last year or two) tried to exert such an influence; it has been conducted with apparent entire indifference to the

development of members in the younger generation. The same is essentially true of our other geographical societies; they are not particularly concerned with the educational aspect of geography. The prizes offered to schools by one society failed of effect, for there was no substantial basis for the work that they were intended to excite. The societies are chiefly concerned with narrative reports of expeditions and excursions, and with occasional articles of more scientific and studious quality; but even the latter rarely have any effect on the schools, for they hardly ever reach the teachers. Under existing conditions, with membership in the various societies constituted as at present, it is not likely that the conduct of the societies will be materially altered. The educational element of geography will be left in the hands of educators. It will not be taken into the hands of travellers. It will not be taken up by the members who, unable to travel themselves, still enjoy hearing the narratives of returned travellers.

But an entirely additional object is also in the minds of the promoters of the *Journal of School Geography;* namely, the better education in geography of the tens of thousands of school children who will never hear anything about geographical societies; and, to this end, the better cultivation of the great body of teachers who ought in an ideal state to be students of geography, and who as such ought to be members of geographical societies, but who under existing and long enduring conditions can not be either. The great body of our teachers have had but an elementary education and have little time or inclination for study. They cannot be reached by a high-class scientific journal, such as Professor Russell contemplates, but some of them may be reached by a personally subsidized journal of low subscription price. Their work will thus be improved, and the children under them will profit thereby; but this is an end which the consolidated *American Journal of Geography* cannot hope to reach. Indeed if, under a rearranged human nature, such a journal were established, it could not have a better ally than the *Journal of School Geography.* Even as matters stand, the new journal hopes to be the means of first informing hundreds of school teachers that such institutions as geographical societies and such publications as their journals exist in this country. It is a mistake to confound the objects and fields of two publications, so essentially different.

I believe that Professor Russell is again mistaken in saying that there is nothing in the character of the new journal to indicate that it possesses greater vitality than its predecessors. One of the predecessors was a highly sensational affair, with more pretension than performance. Another was a perfectly sincere performance, but directed to a miscellaneous audience, not conducted by a teacher of school geography, and burdened with the expense of excellent illustrations. The *Journal of School Geography* has the advantage of a single, definite aim. It looks for external support to subscriptions from schools and teachers and from libraries to which teachers resort. It expects that, for a time at least, receipts from subscriptions may not equal expenses; but expenses will at the beginning be kept as low as possible by holding the pages to a minimum, and inserting illustrations only when they are paid for by the author of the illustrated article. In the management of such a journal, some might say it is best to borrow capital and begin with fine illustrations so as to catch subscriptions quickly. Others might say it is best to pay as you go. The latter plan was adopted, and I believe wisely. As soon as illustrations can be afforded, they will be introduced. At present the expenses are moderate; the subscriptions are steadily coming in; and, for one, I believe that such a *Journal of School Geography* may be made to come so near paying for itself that its life will be assured.

W. M. Davis.

Harvard University.

To the Editor of Science: Professor Russell in his letter, entitled 'A New Geographical Magazine,' in Science, March 19th, has given a chance for an expression of opinion that, as responsible editor of the publication in question, I cannot allow to pass. I question very much the suggestion that the ends sought by the *Journal of School Geography* could be better attained by a consolidation of the existing

geographical periodicals into one publication, with a department for teachers. The plan of adding such a department to an existing journal was proposed to the editors of the *Journal of School Geography* and the offer declined because they believed:

1. That the cause of geographical education warranted a separate periodical.

2. That teachers would not and could not subscribe to so expensive a journal as a valuable scientific periodical must be.

3. That educators would many of them shun pedagogic assistance vended by a society whose aims were primarily scientific.

4. That the organ of no one society or combination of societies could be advertised so as to reach the greater number of teachers.

5. That a journal *for* teachers should be edited *by* teachers.

I believe that the new journal has a legitimate right in the educational world for all these reasons and many more. The knowledge of the world may be enlarged for the few by the geographical societies, through the promotion of exploration and research and the publication of the results thereof. It may be enlarged for the many by such a journal as the one in question, if the editors sift and select new and old facts and put them in a form and dress for the larger public, who are not in touch with modern geographic progress. The increasing of the geographic knowledge of the world at large by either of these methods is a proper aim for those interested, and one may be as useful and necessary a task as the other. It may be that success can better be attained by specialization than by a combination of efforts. The *Journal of School Geography* will continue to select facts from the great mass of geographic information, to try and express them in a simple and straightforward manner, and do what it can to help the geographic societies and publications in the wider dissemination of knowledge of the world. This work with the teachers and youth in this generation may bear fruit in the next generation in a larger demand for the consolidation and improvement of the publications of a scientific character.

I agree with Professor Russell that there is need of bettering all the scientific geographical publications in this country. I disagree with him in his idea that there is no room for a journal whose aim is not the publication of new scientific results, but the broader dissemination of geographical knowledge, expressed not in childish, unscientific or pedagogic terms, but in simple English, with a knowledge, on the part of the editors, of the needs and tastes of the readers to whom they would appeal.

RICHARD E. DODGE.
TEACHERS COLLEGE, NEW YORK CITY.

THE DRAINAGE OF THE SAGINAW VALLEY.

TO THE EDITOR OF SCIENCE: Professor Davis has asked me to add a few more instances apropos of his note on the drainage of the Saginaw Valley (p. 337, issue of Feb. 26, 1897). The peculiar circuitous drainage due to moraines of retreat, in which streams do not flow directly to the water of the bay near by, but fetch a compass and make backhanded branches, has numerous other examples in Michigan. Among the most striking are the Sturgeon, which heads in the Huron Mountains, Sec. 9, T. 49N., R. 32E., and flows clear around Keweenaw Bay to empty into Portage Lake, and the region of Grand Traverse Bay, where the Rapid River, Boardman River, Platte River and the Betsie River show a similar type of drainage, which we may call willowy. For in discussing a relation of branches it seems natural to use a term borrowed from botany. A comparison of a drainage map of the Saginaw Valley with the pendent branching of the willow will show the appropriateness of the comparison, and the term can easily be changed by those who prefer Latin terms into salicious.

ALFRED C. LANE.

SCIENTIFIC LITERATURE.

A Dictionary of Birds. By ALFRED NEWTON, assisted by HANS GADOW, with contributions from RICHARD LYDEKKER, CHARLES S. ROY, etc. London, A. and C. Black. [The Macmillan Company, 66 Fifth Avenue, New York.] 1893–1896. 1 vol., 8vo, pp. *i–xii* + *1–124*, i–viii + 1–1088. Map and unnumbered figg. in text.

The ninth edition of the Encyclopædia

Britannica contains a long series of short articles on birds, which have seldom been approached and never equalled for pith and point in the literature of Ornithology. The same publication also contains two extensive articles, under the heads of *Aves* and of *Ornithology* respectively, in which the science itself and the history of the science are set forth in a masterly manner. It does not suffice to call these contributions able and authoritative; they are mainly from the most facile and forceful pen that has ever been bent in the service of the science of which Professor Newton is a foremost exponent and ornament. The whole of these articles have served as the foundation of the present Dictionary, for which purpose they have been modified into something like continuity, so far as an alphabetical arrangement will admit; and supplemented by the intercalation of a much greater number, be they short or long, to serve the same end. "Of these additions by far the most important have been furnished by my fellow-worker, Dr. Gadow, which bring the anatomical portion to a level hitherto unattained, I believe, in any book that has appeared" (Note, p. v). Less numerous though not less valuable articles have been contributed by Mr. Lydekker, and others of great merit by Professor Roy. The result may be correctly characterized as altogether the best book about birds that has ever been written in English or any other language.

Of writings on Ornithology there is no end. As Professor Newton says (*p. 22*), "the desponding mind may fear the possibility of its favorite study expiring through being smothered by its own literature." So huge has the accumulation become that the most expert bibliographer could no more than guess vaguely the total of titles a complete catalogue would contain; no such catalogue exists, nor is likely to ever be produced. The total number of species now known may be somewhere about eleven thousand only; but they will average several synonyms apiece, in Latin binomial form. Generic names in current usage are several thousand, and their synonyms are still more numerous. Non-technical names of birds in English use are derived from almost every language that has been reduced to writing, and a vast number of purely English 'phrase-names' (consisting of more than one word) are employed. We must add to this rough tally all the biological terms which are peculiar to Ornithology, or which this science shares in common with other branches of zoology. A bare list of words which might serve as entries for a Dictionary of Birds would make a bulky volume, without a line of text to define them; and any treatment of such a mass of verbiage in its entirety would be practically impossible, even were it desirable. A majority of such candidates for lexicography make a rubbish heap not worth overhauling. No one knows this better than Professor Newton, who has made no attempt in this work "to include in it all the names under which Birds, even the commonest, are known" (p. v). He characterizes his selection of names to be entered as 'quite arbitrary;' but we may be permitted to testify that his arbitration is that of a tactful expert who understands the beauty of utility, and has governed himself accordingly. How many entries there may actually be we have hardly any idea; the alphabet runs for more than a thousand pages; the articles range from a line or two to several pages, presumably according to the author's estimate of the relative interest or importance of their respective subjects. Regarding the form as distinguished from the substance of the work we cannot do better than here repeat its eminent author's significant words (p. vii):

"I would say that the alphabetical order has been deliberately adopted in preference to the taxonomic because I entertain grave doubt of the validity of any systematic arrangement as yet put forth, some of the later attempts being, in my opinion, among the most fallacious, and a good deal worse than those they are intended to supersede. That in a few directions an approach to improvement has been made is not to be denied; but how far that approach goes is uncertain. I only see that mistakes are easily made, and I have no wish to mislead others by an assertion of knowledge which I know no one to possess; yet with all these drawbacks and shortcomings I trust that this Dictionary will aid a few who wish to study Ornithology in a scientific spirit, as well as many who merely regard

its pursuit as a pastime, while I even dare indulge the hope that persons indifferent to the pleasures of Natural History, except when highly-coloured pictures are presented to them by popular writers, may find in it some corrective to the erroneous impressions commonly conveyed by sociolists posing as instructors."

The 'drawbacks' and 'shortcomings' to which the modesty of a master of the art of exposition and a past master of birdcraft may permit him to allude in speaking of his own performance appear to the present reviewer to be a drawing back from profitless penwork and a coming short of adding anything to the rubbish heap above specified. The plan of the work is not open to any criticism, except it be captious, and its execution is such as makes mere praise seem impertinent.

A respect for precision of statement which verges on scrupulosity is a prime quality of this author's mental furnishing, and his ability to reflect that quality clearly is conspicuous in his literary composition. An ornithologist who should be asked, 'What is a Wagell?' would probably reply, 'A young Black-backed Gull.' This would be right, but not exactly right. We will give what Professor Newton says about this name as a single sample of one of his short 'definitions,' as distinguished from any of the extended articles in this book:

"WAGELL,* the Cornish name of a bird of which Ray and Willughby were told, 30th June, 1662, on Godreve Island near St. Ives in Cornwall (*Memorials of Ray*, ed. Lankester, p. 188, and Ray, *Collection of Words*, p. 93). From what is said of it the Arctic Gull (SKUA, p. 870 [small caps for cross-reference]), seems to have been meant, but they took it to be the young of what we now know as *Larus marinus*, and so the name has been attached to that species by subsequent writers.†"

The Dictionary has appeared in four parts, running 1893–'96, the last part having been issued in November or December of 1896. Besides finishing the alphabet (*Sheathbill-Zygodactyli*) and furnishing the permanent title, preface and indexes, it brings us the cream of the whole performance in its Introduction (*pp. 1–124*). Upon the Britannica basis already indicated Professor Newton has erected an imperishable monument. The task he set himself was nothing short of a critical review of ornithology and of ornithologists in few more than one hundred pages. The result is something to which no other writer who has ever lived has attained. It may possibly add somewhat to the luster of a name already renowned; it will, if any thing can; but certainly it illuminates the whole history of the subject. Professor Newton is unequalled, if not unapproached, by any person now living, in his grasp of ornithological literature, and all the resources of his erudition have been brought to bear upon this summation of his subject, with rare tact and skill, with still rarer sense of historical perspective. It is a masterpiece of composition, in perfect focus and adjustment, without a blurred line from start to finish. Professor Newton is nothing if not accurate in statement of facts, nothing if not cautious and conservative in expressions of opinions, nothing if not scholarly in his modes of locution; these are qualities which all his writings display conspicuously, and we have a right to hold him to them, requiring him never to fall short of a standard of excellence he has taught us to expect to find in his work. But we admire not less, in this instance, what we may call the temper of this piece of writing—so eminently wise, just, kindly, courteous, dignified, and withal of fine academic flavor without a trace of pedantry. In its impersonal aspects, as merely a matter of erudition, it was no easy thing to do; it became one of increased difficulty and great delicacy, in its personal bearings. Professor Newton has relaxed nothing of rigid censorship, maintaining his judicial character throughout, and passing severe sentences in more than one case; but few there will be, we imagine, to dispute the fairness with which he has rendered his even-handed decisions. It was an invidious task, to bring so many of his contemporaries to the bar, to answer for their performances; but it

"*The derivation and pronunciation of this word are unknown to me. It is spelt indifferently by Ray with one *l* or two. I preserve the latter form as possibly indicating a stress to be laid on the last syllable."

"†See *Additions to Borlase's Natural History* (reprinted from *Journ. R. Inst. Cornwall*, Oct. 1865), Truro: 1865, p. 46."

has been executed with scrupulous fidelity. Some offenders will writhe at the point of his pen, as they feel the keen discernment of his criticisms, and others may thank their own insignificance for the charitable mantle of his silence. Meanwhile, this Introduction takes its rightful place as the most valuable and most interesting contribution ever made to the subject of which it treats.

Lacking space for any adequate analysis of this portion of the Dictionary, we prefer to say no more.

ELLIOTT COUES.

Recent Geological Bibliographies. (Bibliography and Index of North American Geology, Paleontology, Petrology and Mineralogy for 1895; F. B. WEEKS; Bul. U. S. Geol. Survey, No. 146, 130 pp.; Washington, 1896. Bibliography of Missouri Geology; C. R. KEYES; Mo. Geol. Surv., Vol. X., pp. 221–523; Jefferson City, 1896.)

Perhaps there are no publications more welcome or more serviceable to the worker in any branch of science than bibliographies. When accurately and conveniently arranged they save the specialist much time, energy and money. One who is not a specialist is even more dependent on them. This is particularly true in our country, where so many who are interested in scientific subjects are necessarily located where library facilities are poor. The worker in some small town, miles, perhaps, from any really good library, learns to carefully treasure all bibliographic matter. Bibliographies render distant libraries more or less accessible, and enable book purchases to be made by mail with the same certainty of satisfactory selection which comes from personal examination. A glance over the list of periodicals examined by Mr. Weeks shows that it is quite complete. Indeed the U. S. Survey library is one of the most complete geological libraries in America. The acquisitions for 1895, as listed here, include 575 titles. In Mr. Weeks' paper there is, under each title, a brief abstract of the contents of the paper noted. This in a certain sense brings the library to each worker, while a visit to the library would be impossible to many geologists, except at great expense.

The survey has from the first recognized the responsibility which comes with the possession of an excellent library, and has issued many helpful bibliographies.* Two of these were compiled by Mr. Weeks, and their wide use has shown that they were carefully planned and conscientiously executed. In the present, as in the preceding papers, the references are full and clear, the abstracts concise and the arrangement convenient. Limits have necessarily been drawn. The proper limits to such a work are a matter of opinion. It would seem, for instance, that signed editorials in standard journals might properly be included, since they often contain much which is germane to current geologic discussion. In this they seem on a par with signed reviews which have been included. While certain trade journals, such as *Engineering and Mining Journal*, have been included, others, which often contain original papers of merit, for example the *Colliery Engineer*, have been excluded. Since so large a portion of the work of the modern geologist has to do with economic subjects, an extension of the scope of the work to include a larger portion of the economic literature would be welcome. Certain of the discussions in such a book as 'The Mineral Industry,'† would probably be as helpful to the working geologist as some of the strictly paleontologic literature noted. This is a criticism, not of the bibliography itself, but upon its possibly too restricted scope.

The paper by Dr. Keyes is on a somewhat different plan. The attempt has been made to bring together all the literature bearing upon the geology of a single State. The result is that a considerable number of titles have been added to the list published by Sampson.‡ There is the same lack, however, of references to important economic literature that is shown by Mr. Weeks' paper. Numerous papers upon the zinc and lead deposits of Missouri have been published in the *Engineering and Mining Journal*, and any one studying the deposits would need to be familiar with these papers, yet none have

*See Bulletins 7, 13, 44, 63, 69, 71, 75, 91, 99, 100, 102, 121, 127, 130, 135.

†Scientific Pub. Co., New York.

‡Geol. Surv. Mo., Bul. 2, 158 pp. Jefferson City, 1890.

been noted. It would seem that, in this case at least, too much has been eliminated. The list is quite complete otherwise. It is particularly rich in references to the geology of the surrounding region. Such side references are especially valuable to workers in Missouri, since they recall widely scattered notes which might otherwise be overlooked. The paper also becomes more than a mere bibliography of Missouri. It is a guide to the study of the geology of the central Mississippi Valley and brings out excellently the development of our present knowledge from a historical point of view. Such a bibliography could only come as a result of wide studies throughout the region and is a natural sequence to the similar publication issued by Dr. Keyes while connected with the Iowa Survey.* The general scope and arrangement of the paper is the same as that followed by the author in the Iowa bibliography. The abstracts are perhaps briefer than those given by Mr. Weeks, but its value is very largely increased by the dictionary arrangement. A not unimportant feature of both the bibliographies reviewed is the very full accompanying index.

H. F. BAIN.

*Iowa Geol. Surv., Vol. I., pp. 209–464. Des Moines, 1893.

SOCIETIES AND ACADEMIES.

CHEMICAL SOCIETY OF WASHINGTON; THE 93D REGULAR MEETING, WASHINGTON, D. C., FEBRUARY 11, 1897.

THE Society was called to order at 8 p. m. by the President, Dr. Bigelow, with twenty-five members and several invited guests present.

The first paper of the evening was read by Dr. E. W. Allen, and was entitled 'A Critical Review of Aikmann and Wright's Translation of Fleischmann's Lehrbuch der Milchwirtschaft,' an abstract of which has been presented by the author: "Attention was called to the heavy verbose style of the translation, and often foggy statements, errors in translating the sense and failure to adapt the book for English and American readers, and to correct certain statements which do not apply at the present status of knowledge. The fallacy of translating a book for students and semi-popular use, without editing the translation and in a measure adapting it to the new field, was pointed out."

Dr. H. Carrington Bolton exhibited two British patents which he has described in SCIENCE (p. 401).

Mr. W. H. Krug read a review, from the German, of a paper by Adolph Meyer entitled 'The Maximum of Plant Production.'

Mr. Wirt Tassin's paper was entitled 'A New Blowpipe Reagent.' He gave a review of the use of iodine in blowpipe analysis from the time of Bunsen to Haanel and Andrews. He then stated that for several years past he had been using iodine in several forms and found that a mixture of equal parts of iodine and potassium sulfocyanate, plus a little sulfur, the whole being intimately mixed, fused and then ground, gave the most satisfactory results. The powder was used as a flux on a gypsum tablet. A series of the iodine and cyanate films produced by some forty minerals was shown. Some of these illustrated the extreme delicacy of the test; others showed the effect that the coating produced by one element had upon that produced by another when they were deposited together; still others showed the methods of differentiating interfering elements. Some attempts at quantitative methods were shown, and attention was called to the fact that a mixture of three parts of alcohol and one part of chloroform burned in a lamp gave rise to some very interesting reactions either with or without the iodine flux.

The Society adjourned at an early hour, and the remainder of the evening was devoted to feasting and social discourse.

SPECIAL MEETING, TUESDAY, MARCH 9, 1897.

A SPECIAL meeting of the Chemical Society was held in the Assembly Hall of the Builders' Exchange Club, under the auspices of the Joint Commission of the Scientific Societies of Washington, to hear the address of the retiring President, Dr. E. A. de Schweinitz, upon 'The War with the Microbes,' which will be printed in SCIENCE. The speaker was introduced by Surgeon General Sternberg, of the United States Army, and the hall was filled with members of

the Society, medical men and over 300 invited guests from the other scientific societies of Washington.

V. K. Chesnut,
Secretary.

GEOLOGICAL SOCIETY OF WASHINGTON; MEETING OF MARCH 10, 1897.

The Geological Relations of some Southern Iron Ores. By C. Willard Hayes, U. S. G. S.

Notwithstanding all that has been written concerning the Southern iron ores, there has as yet been no satisfactory statement of their geological relations. This is particularly true of the brown ores or limonites. The latter are separated by the writer into two classes, the gossan ores and the brown, valley ores. The latter class is by far the most important. An examination of many hundred deposits in connection with the study of the areal geology of the region in which they occur has led to a classification in three groups depending on their genesis and present relations. The first group comprises a large number of deposits composed chiefly of gravel ore imbedded in red clay near the top of the Knox dolomite. During the period of Tertiary baseleveling, the Chickamauga limestone, which overlies the Knox dolomite, was reduced to baselevel somewhat before the latter, and areas underlain by the limestone received the drainage from adjacent areas of the dolomite. Deposits of bog ore were there formed, and when the limestone was again reduced to a lower level, shortly after the elevation of the region, a part of the ore deposits were left at the altitude of the Tertiary peneplain, forming a fringe about the depressions which resulted from the removal of the limestone. Deposits belonging to the second group occur along the base of Cambrian quartzite ridges where the quartzite passes with steep dip beneath the siliceous limestone underlying the adjacent valleys. The deposits are regarded as segregations of the iron originally disseminated through the limestone, concentrated upon the impervious bed of quartzite during the progressive reduction of the limestone surface. In the third group are the extensive deposits associated with the numerous thrust faults of the region. While the deposits belonging to the two groups above described are due wholly to the surface concentration of disseminated iron, the deposits of this group are produced, in part at least, by iron brought in solution from considerable depths below the surface. Their character depends largely on the kind of rocks cut by the fault. Where these are quarizites the iron may be in the form of ocher directly replacing the silica, or it may occur as the cement in a fault breccia or rarely, filling true fissure veins. The largest deposits occur in connection with faults between quartzite and limestone or between two limestone formations, where they are intimately associated with deposits of bauxite, the hydrated oxide of aluminium, and the two ores are probably closely connected in origin.

Geologic Notes on Kansas, Oklahoma and Indian Territory. By T. Wayland Vaughan, U. S. G. S.

Mr. Vaughan presented the results of a general reconnoissance made from Muskogee, I. T., via Tulsa, I. T., Perry, Enid and Alva, Oklahoma, to Coldwater and Medicine Lodge, Kansas; thence back to Coldwater, and south by Woodward, old Camp Supply, Taloga, Arapaho, to the Wichita mountains, in Oklahoma. The journey from Muskogee to Medicine Lodge was made in company with Professor L. F. Ward. The Wichita mountains were reconnoitered as far west the North Fork of Red River, east of Mangum, and along their northern side eastward to Ft. Sill, at their eastern end; thence eastward, keeping on the north side of the Arbuckle Hills.

Mr. Vaughan considered the Tishomingo granite (of Mr. Hill) in the Choctaw Nation, as probably of Archæan age. The axis of the Wichita mountains consists of solid plutonic masses, forming numerous isolated peaks, or groups of peaks, separated by wide, very level, grass-covered valleys. The mountains are very rugged and precipitous, and rise from several hundred to more than a thousand feet above the valleys between them. A series of the rocks collected was found to consist of hornblende granites, which form most of the mountains, and an interesting series of gabbro rocks. The rounded hills northwest of Ft. Sill are composed of quartz poryhyry. The age of the plutonic axis of the Wichita mountains is still undeter-

mined, but as the Red Beds (Permotrias) were found resting against one of the granite mosses, with an arkose at their base, it must be older than the Permian. The Silurian was found north of the Wichita mountains, forming hogbacks, and at Ft. Sill the fossils showed the limestone to be Ordovician. Ordovician and Upper Silurian strata were found north of the Arbuckle Hills.

No definite line could be drawn between the Carboniferous and the Permian, or between the Permian and the Trias.

In discussing the Cretaceous (Comanche Series) the following facts were noted: In the vicinity of Belvidere, Kansas, the Cretaceous extends above the highest divides, but is deposited upon the eroded surface of the Red Beds. As one goes southward the Cheyenne sandstone member disappears, the Kiowa shales become thinner, and the cretaceous beds rest against the sides of the Red Bed hills. Ten miles northwest of Taloga, and in the vicinity Arapaho, the Cretaceous is an agglomerate of *Gryphæa forniculata* (White), the *G. pitcheri* of Marcou, a few feet thick. The *Gryphæia tucumcarii* of Marcou, a fossil asserted by him to be Jurassic, often occurs imbedded in the same matrix.

The Great Plains formation does not extend as a continuous formation east of a line from Alva to Woodward, Taloga and Arapaho, nor south of Arapaho.

There were also communications on 'Oscillations of the Coast of California, during the Pliocene and Pleistocene,' by H. W. Fairbanks, and on a 'Discovery of Marine Cretaceous deposits in Eastern Virginia,' by N. H. Darton; but these are here referred to by title only, for want of space.

W. F. MORSELL.

U. S. GEOLOGICAL SURVEY.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

February 4, 1897. THE meeting was devoted to the annual address of the retiring President, C. L. Marlatt.

The address was entitled 'A Brief Survey of the Science of Entomology from its Beginning to the Present Time.' A running account was given of the history of the study of insects and of the persons who have been most prominent in such work from the earliest times to the present, classified in accordance with their relation to prominent men or well marked periods. With the historical summary as a basis, estimates were made of various phases of the results of the study, as follows: An estimate was given of the total amount of the literature of entomology, considered both at the various past periods and at the present time. It was stated that the total writings on insects would probably amount to between 12,000 and 15,000 volumes of 500 pages each. The actual number of persons interested in the study of insects at various times was estimated, and from various sources of information it was deduced that there are from 3,000 to 4,000 persons now living who, either as students, writers or collectors, are interested in the science of entomology. The address concluded with a summary of the results so far accomplished, particularly in the field of systematic entomology and the relation this bears to what remains to be done. The estimates were based upon the actual number of described species, in comparison with the estimates of species still to be described or discovered, and also in connection with the present rate of progress as indicated by the annual or periodical works of record in zoology.

March 18, 1897. Mr. Ashmead showed specimens of *Halobatopsis beginii*, recently described by him in the *Canadian Entomologist*.

Dr. Motter read letters from Dr. Wyatt Johnson, of Quebec, and Garry de N. Hough, of New Bedford, giving accounts of investigations by both observers of the fauna of cadavers, and showing in what respects their results differed from his own.

Mr. Busck exhibited six larvæ of *Anthrenus varius*, each of which showed well marked wing pads on the second and third thoracic segments.

Mr. Ashmead read a paper entitled 'Five new hymenopterous parasites from *Canarsia hammondi*.' These parasites were among a series reared by Mr. W. G. Johnson in Illinois, in the course of an investigation of the host insect. The new species were *Spilocryptus canarsiæ*, *Limneria canarsiæ*, *Apanteles canarsiæ*, *Elasmus meteori* and *Tetrastichus cærulescens*.

Mr. Ashmead also read a paper entitled 'A

new species of Roptronia.' The type was collected by Mr. Garman in Kentucky.

Mr. Howard read a paper entitled 'On some parasites of Coccidæ,' in which he referred to the extraordinary geographical distribution of certain of the forms. *Aspidiotiphagus citrinus* (Craw), for example, has been found in many localities of the United States; at Grenada, B. W. I.; Portici, Italy; Punduloya and Kandy, Ceylon; Hong Kong and Amoy, China; Tamsui, Formosa; Yokohama, Japan; Newlands, Cape Colony; Brisbane, Queensland; Adelaide, South Australia; and Honolulu, Hawaii. He also showed that *Arrhenophagus chionaspidis* (Aurivillius) has an almost equally universal distribution, and announced the finding of the hitherto unknown male of this species in some material reared by Mr. Koebele at Macao.

A paper by Mr. W. J. Fox, entitled 'The species of the genus Pepsis found in America north of Mexico,' was read by title.

A synopsis of a paper entitled 'Notes on bred parasitic Hymenoptera, with descriptions of new species,' by Geo. Dimmock and Wm. H. Ashmead, was presented by Mr. Ashmead.

L. O. Howard,
Secretary.

NEW YORK ACADEMY OF SCIENCES, SECTION OF GEOLOGY, MARCH 15, 1897.

The first communication of the evening was by Mr. Heinrich Ries, entitled 'Mineralogical Notes.' Mr. Ries spoke of some Allanite crystals with new faces; also of some large crystals of fibrous gypsum from Newcastle, Wyoming; also exhibited some large Childrenite crystals from Maine, and some Amphibole crystals with many terminal faces from Virginia. He also spoke of some Pseudomorphs of gold after Sylvanite from Cripple Creek, Colorado. The finding of a new Beryl crystal, with an unusually large number of terminal faces in New York City, was also noted.

The second paper of the evening was written by Mr. Herbert Bolton, entitled 'The Lancashire Coal Field of England,' and read in abstract by President Stevenson. The paper spoke of the geographic conditions of the Lancashire coal field and its neighborhood, of the extent and quality of the coal and of the age of the structural movements which had caused the present geological characteristics in the coal area. A careful correlation was made between the Coal-measures of this field and the deposits of the United States. Distribution of the fauna and flora and their character was taken up in some detail, and it was shown that in the Lower Coal-measures the life is mostly marine, in the Middle Coal-measures of fresh and blackish origin, and in the Upper Coal-measures that the fauna was scarce. When published, this paper will be a valuable contribution to the literature of coals and will be of great assistance to workers in America in their endeavors to correlate the deposits on the two sides of the water.

The third paper of the evening was by Mr. Stuart Weller, of Chicago University, entitled 'The Batesville Sandstone of Arkansas,' and abstracted by Mr. Gilbert van Ingen. The paper entered into some detail regarding the Batesville section and the fauna of the Batesville sandstone in that section. Of the invertebrates thirty species have been found, of which eleven point to the St. Louis age of the sandstone, six to the Kaskaskia age, while thirteen are of indeterminate value. On account of the greater abundance of the numbers of specimens of the second group and from stratigraphic evidence as well, it is probable that the sandstone belongs in the base of the Kaskaskia group and is the same as the Aux Vasa limestone of southern Illinois. This paper gives the data wherewith to correlate the Mississippian section with the section about the Ozark Hills.

Richard E. Dodge,
Secretary.

NEW BOOKS.

Diseases of Plants induced by Cryptogamic Parasites. Karl Frelherr von Tubeuf. London, New York and Bombay, Longmans, Green & Co. 1897. Pp. xv+598.

The Fern Collector's Handbook and Herbarium. Sadie F. Price. New York, Henry Holt & Co. 1897. 72 figures.

Electricität direkt aus Kohle. Etienne de Fedor. Wien, Pest, Leipzig, A. Hartleben. Pp. vi+304. Mark 3.